Series 1957, No. 5 Issued September 1960

SOIL SURVEY

Orange County Florida

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
UNIVERSITY OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Orange County will serve several groups of readers. It will help farmers and livestock men in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; and add to the soil scientist's fund of knowledge.

In making this survey, soil scientists examined fields, woods, rangelands, and marshlands. They dug holes and looked at surface soils and subsoils; measured slopes with a hand level; noticed differences in the growth of crops, weeds, grasses, and trees; and, in fact, recorded those things that they thought might affect the suitability of the soils for farming, livestock production, engineering, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. Then, cartographers prepared the detailed soil map that is in the back of this report. Woods, pastures, roads, bays, creeks, and many other landmarks are shown on the map. Open fields, citrus groves, and urban areas are also visible. The aerial photographs were taken in 1954, and, consequently, the map will not show changes made in fields or groves since that time.

Locating soils

Use the index to map sheets to locate areas on the large soil map. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large soil map is located. When the correct sheet of the large soil map has been located, it will be seen that boundaries of the soils are outlined and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. The symbol will be inside the area if there is enough room; otherwise, it will be outside the area and a pointer will show where the symbol belongs.

Finding information

Few readers will be interested in all of the soil report, for it has special sections for different groups, as well as some sections of value to all. The introductory part, which mentions climate and physiography and gives some statistics on agriculture, will be of interest mainly to those not familiar with the county.

Farmers and those who work with farmers will be interested mainly in the sections, General Soil Map, Descriptions of Soils, and Management of Soils. Study of these sections will aid them in identifying soils on a farm, in learning ways the soils can be managed, and in judging what yields can be expected. The Guide to Mapping Units at the back of the report will simplify use of the map and the report. This guide gives the map symbol for each soil, the name of the soil, the page on which the soil is described, the capability unit in which the soil has been placed, and the page where the capability unit is discussed.

Engineers will want to refer to the section, Engineering Properties of the Soils. The table in that section shows characteristics of the soils that affect engineering.

Soil scientists will find information about how the soils were formed and how they were classified in the section, Genesis, Morphology, and Classification of Soils.

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

* * * * *

Fieldwork for this survey was completed in 1956. Unless otherwise indicated, all statements in the report refer to conditions in the county at that time. This publication on the soil survey of Orange County, Fla., is part of the technical assistance furnished to the Orange County Soil Conservation District.

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SOIL SURVEY OF ORANGE COUNTY, FLORIDA

BY RALPH G. LEIGHTY, IN CHARGE, D. T. BREWER, AND W. R. SMITH, UNIVERSITY OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS, AND O. E. CRUZ, E. H. EVENSON, F. MATANZO, D. S. TAYLOR, R. M. CRAIG, W. G. DIAMOND, E. D. MATTHEWS, M. S. MORGAN, AND H. O. WHITE, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

CORRELATION BY A. H. HASTY, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE UNIVERSITY OF FLORIDA AGRICULTURAL EXPERIMENT STATIONS

ORANGE COUNTY, in the north-central part of the Florida Peninsula, is somewhat rectangular in shape. It extends about 48 miles from east to west and a maximum of 30 miles from north to south. It is bounded on the north by Seminole and Lake Counties, on the west by Lake County, and on the south by Osceola County. The eastern boundary is the St. Johns River, which separates the county from Brevard County (fig. 1). Orlando, the county seat, is in the north-central part of the county.

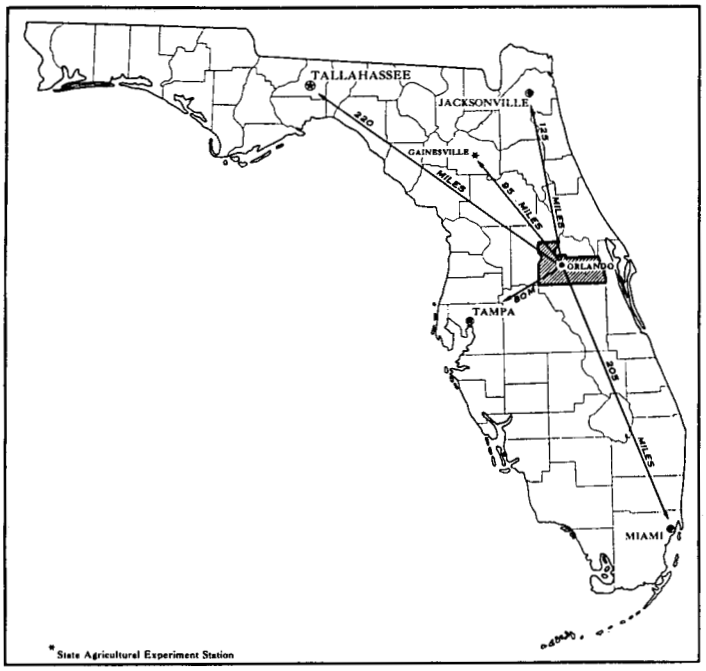

Figure 1.—Location of Orange County in Florida.

The total land area is 916 square miles, or 586,240 acres. In addition, approximately 55,680 acres is covered by the water of the many lakes in the county.

The agriculture of Orange County consists mainly of the growing of citrus fruits, vegetables and other truck crops, and nursery stock, and the raising of dairy cattle and beef cattle. Forestry is also important. Citrus trees have been planted on most of the slopes in the undulating areas in the western part of the county. Large quantities of vegetables that tolerate cold are grown during the fall and spring on the organic soils near Zellwood and Plymouth and on the somewhat poorly drained and poorly drained soils near Winter Garden.

Many thousands of acres of improved pasture in the eastern and southern parts of the county furnish grazing for beef cattle and dairy cows. Large areas of native forests and areas covered by short grasses, now being used for unimproved pasture, may be suitable for more intensive farming.

The subtropical climate of Orange County attracts many tourists during the winter. Many new residents from the Northern States are moving into the county. As a result, the populations of Orlando and other communities are increasing rapidly.

General Soil Map

Soils that normally occur together in a characteristic geographic pattern can be said to make up a general soil area, also called a soil association. A general soil area may contain many soils or only a few. The nature of the general soil area influences not only the type of agriculture, but also the agricultural practices required for the proper use and maintenance of the soils.

The soils of Orange County are in seven general areas. These areas have been delineated and are shown by number and color on a map in the back of this report. In the text that follows, each area is described in terms of the dominant kinds of soils.

The soils within each general area are somewhat similar in relief, drainage, and reaction and in the kind of parent material from which they have formed. They differ from each other in one or more minor characteristics, such as color, texture, or the amount of organic matter in the surface soil. Generally, the soils within each general area in Orange County have similar suitability for crops and may be expected to respond in

about the same way if given similar management (*5*).[1]

Excessively drained soils: St. Lucie-Pomello-Blanton.—This general soil area, number 1 on the general soil map, consists principally of excessively drained soils formed from thick deposits of sand. It is made up mainly of St. Lucie soil but includes soils of the Pomello and Blanton series, which have less rapid drainage than the St. Lucie soil. This general soil area occupies about 1.7 percent of the land area in the county.

The St. Lucie soil is mainly on low knolls and ridges in the western part of the county. It has slopes of as much as 5 percent. Its thin, light-gray surface layer is underlain by white, loose, noncoherent sand that normally extends to depths of more than 48 inches. In a small acreage, however, yellow or brownish-yellow sand occurs at depths below 10 to 24 inches. The St. Lucie soil is strongly acid throughout. It is droughty and is very low in organic matter and plant nutrients.

The scrub vegetation on most of this general area provides poor grazing for livestock and produces poor-quality timber. The soils are not suitable for cultivated crops or improved pastures. Areas near lakes and towns are suitable for building sites.

Somewhat excessively drained to moderately well drained soils: Lakeland-Eustis-Blanton-Orlando.—This general soil area, number 2 on the general soil map, consists of somewhat excessively drained to moderately well drained soils formed from thick deposits of sand. It is made up mainly of Lakeland, Blanton, Eustis, and Orlando soils but includes the less extensive Esto soil. The soils are generally nearly level to strongly sloping, but a few, short, steep slopes occur near sinkholes, lakes, ponds, and streams. The soils are principally in the central part of the county and occupy about 18.2 percent of the total land area.

Most of the soils consist of fine sand to depths of more than 42 inches. In some areas of the Blanton soils, however, fine sandy clay loam begins at depths of 30 to 42 inches, and in some areas of Esto soil it is at depths of less than 30 inches. In most of the soils, the surface layer is grayish brown to dark gray and is 4 to 8 inches thick. The Orlando soils have dark-gray to black surface soils that are 9 to 18 inches thick.

The lower horizons of the principal soils are colored as follows: Lakeland soils—yellow, yellowish brown, or brownish yellow; Blanton soils— pale yellow or splotched pale yellow, light gray, or white; Eustis soils—strong brown to yellowish red; and Orlando—pale brown to light gray.

Most of these soils are low in plant nutrients and are somewhat droughty during long, dry seasons. If the weather is favorable and good management is practiced, they can be used for suitable field crops, citrus and other subtropical fruits, improved pastures, and forests. In some depressions, however, the air drainage may be too poor for citrus trees to grow well. The Lakeland and Eustis soils and the high phases of the Blanton series are somewhat droughty for growing improved pasture grasses.

Somewhat poorly drained soils: Leon-Immokalee-Pomello-St. Johns.—This general soil area, number 3 on the general soil map, consists of somewhat poorly drained soils formed from moderately thick deposits of sand. It is made up mainly of Leon, Immokalee, St. Johns, and Pomello soils but includes less extensive areas of Ona and Scranton soils. This general area occupies about 39.1 percent of the total land area in the county; the Ona and Scranton soils make up only about 1.3 percent. The soils are level to very gently sloping. They are mainly in the eastern, southern, and northwestern parts of the county.

The surface layers are gray to very dark gray in the Leon and Immokalee soils; light gray to gray in the Pomello soils; and very dark gray to black in the St. Johns soil. The surface layer of the St. Johns soil is more than 8 inches thick. The St. Johns and Leon soils have an organic pan that begins at depths between 14 and 30 inches, but the organic pan in the Immokalee and Pomello soils begins at depths between 30 and 60 inches.

The Ona soil has a black to dark-gray surface layer that is 6 to 12 inches thick. This is underlain by a brown, organic-stained horizon that grades to lighter colored fine sand with increasing depth. The Scranton soil has black to dark-gray upper layers that have a total thickness of 9 to 24 inches. These are underlain by pale-yellow to light-gray fine sand.

The soils of this general area are strongly acid to very strongly acid and are low in plant nutrients. Except for the Scranton, Ona, and St. Johns soils, which have moderate to large amounts of organic matter in the surface layer, they are low in organic matter.

Under natural conditions the soils are suitable for native and improved pastures and forests. Adequate drainage and supplemental irrigation will benefit the improved pastures. Under good management, which includes adding fertilizer, liming, draining adequately, and providing supplemental irrigation, fair yields of suitable field crops and vegetables are obtained. Medium to high yields of citrus fruits are obtained on adequately drained areas of Scranton and Ona soils.

Somewhat poorly drained to poorly drained soils: Adamsville-Pompano-Delray.—This general soil area, number 4 on the general soil map, consists mainly of somewhat poorly drained to poorly drained soils. The soils have formed from deposits of sand that overlie alkaline materials. The principal soils are the Adamsville, Pompano, and Delray, but Keri, Parkwood, Felda, and Manatee soils are also included. The soils are nearly level. They are mainly in the eastern part of the county near the flood plain of the St. Johns River. These soils occupy about 5.7 percent of the land area in the county.

The Adamsville, Keri, and Parkwood soils are somewhat poorly drained. They have gray to very dark gray surface layers that are 4 to 8 inches thick. In the Adamsville soils, the surface layers are underlain by yellowish-brown to light-gray fine sand that extends to depths of more than 30 inches. In the Keri soil there is a layer of marl, 6 to 12 inches thick, that begins at depths of 12 to 30 inches; the lower part of the subsoil is made up of light-gray and yellow sand. The Parkwood soil has a thin mantle of sand underlain by a thick layer of marl.

The Pompano, Charlotte, Felda, Delray, and Manatee soils are poorly drained to very poorly drained. The surface layers of the Pompano, Charlotte, and Felda soils

[1] Italic numbers in parentheses refer to Literature Cited, p. 62.

are dark grayish brown to very dark gray and are 2 to 6 inches thick. The lower layers of these soils have the following colors: Pompano—light gray to pale brown; Charlotte—brownish yellow to reddish yellow; and Felda —pale yellow, light gray, or light gray mottled with yellowish brown. In the Felda soil, fine-textured materials are within 30 inches of the surface.

The Delray and Manatee soils have black or very dark gray surface layers that are 9 to 20 inches thick. The color of the lower horizons ranges from gray or light gray to pale yellow, mottled in a few places with yellowish brown or brownish yellow. The Delray soils have sand to depths of more than 30 inches, but the Manatee soils have fine-textured materials at depths within 30 inches of the surface.

Areas of Adamsville, Keri, and Parkwood soils that have not been cleared are covered by cabbage palmettos, saw-palmettos, pines, a few hardwoods, and shrubs, sedges, and grasses. The small areas that have been cleared are good for improved pastures. Unimproved areas of the Pompano, Charlotte, Felda, Delray, and Manatee soils are used for grazing cattle, for wetland forests, and, to a limited extent, for water storage. Areas of these soils may be covered with water for a period of several weeks. If the soils are adequately drained, irrigated, fertilized, and otherwise well managed, medium to high yields of vegetables and other truck crops are obtained. The soils can also be used for suitable field crops and improved pastures.

Poorly drained to very poorly drained soils: Rutlege-Plummer-Fresh water swamp.—This general soil area, number 5 on the general soil map, consists principally of poorly drained to very poorly drained soils. The soils have formed in moderately thick deposits of sand that overlie noncalcareous materials. The general area is made up mainly of Rutlege and Plummer soils but includes Fresh water swamp, a miscellaneous land type. It occupies about 13.7 percent of the total land area of the county.

The soils are in nearly level areas or in depressions. At times they are covered with water during several months of the year. The Rutlege and Plummer soils consist of sand to depths of more than 30 inches. The Rutlege soils have black to dark-gray surface layers, 9 to 15 inches thick, and gray to light-gray or very pale brown lower horizons. The Plummer soils have gray to very dark gray surface layers that are 2 to 6 inches thick and light brownish-gray, light-gray, or very pale brown lower horizons.

These soils are strongly acid to very strongly acid. Under natural conditions they are suitable for native pastures or wetland forests and can be used for water storage to a limited extent. If they are drained adequately, irrigated, limed, fertilized, and otherwise well managed, high yields of vegetables and other truck crops are obtained. The soils can also be used for suitable field crops and improved pastures.

Very poorly drained organic soils: Everglades-Brighton-Pamlico.—This general soil area, number 6 on the general soil map, consists mainly of Everglades, Brighton, and Pamlico soils. It occupies about 3.2 percent of the total land area of the county. The soils are in nearly level areas or depressions and are covered with water during many months of the year.

The Everglades and Brighton soils have surface layers of black to very dark brown mucky peat, 12 to 18 inches thick, that overlie brown or dark yellowish-brown to dark reddish-brown layers of fibrous peat. The peat is underlain by gray to black mineral soil materials. In the Brighton and Pamlico soils, the organic materials range from 12 to more than 96 inches in thickness. In the Everglades soils, they range from 12 to 232 inches in thickness.

The Brighton and Pamlico soils are acid. The organic materials of the Everglades soils are nearly neutral, but below it, they are alkaline.

Under natural conditions, soils of this general area are suitable for water storage or they can be used as wildlife habitats or for recreation sites. When they are not covered too deeply with water, they can be used for limited grazing by cattle. If they are drained adequately and are well managed otherwise, high yields of vegetables and other truck crops, gladiolus and caladium bulbs, and improved pastures are obtained.

Very poorly drained soils, overflow areas: Manatee-Delray.—This general area, number 7 on the general soil map, consists of overflow areas of very poorly drained soils. It is made up mainly of Manatee and Delray soils but includes some areas of Pompano soils. These soils occur on the flood plains of the St. Johns and Wekiwa Rivers. They occupy about 4.2 percent of the total land area of the county. All of the areas are flooded frequently by water from the adjacent streams.

In nearly all of the areas, the surface soil is thick and dark. The depth to fine-textured materials commonly ranges from 0 to 30 inches, but in places these materials begin at depths of 42 or more inches.

On areas near the St. Johns River, the natural vegetation of grasses, sedges, pickerelweed, water iris, and lilies provides fair grazing for cattle. Some areas, principally along the Wekiwa River, have a dense stand of water oak, maple, gum, ash, and other hardwoods and cabbage palmetto and various shrubs. Some timber that is suitable for harvesting is obtained from these areas.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the fields, groves, pastures, and woodlands. He classifies the soils in accordance with the facts observed and maps their boundaries on an aerial photograph or other map. The map shows the location of each kind of soil identified, as well as the roads, houses, streams, railroads, and other natural and cultural features of the landscape.

Field Study.—The soil scientist records everything about the soils that he believes might affect their suitability for farming. He examines surface soils and subsoils; measures slopes with a hand level; and notes differences in growth of crops, weeds, trees, and other vegetation. He bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern but are located according to the lay of the land. Most of them are not more than a quarter of a mile apart, and some are much closer. Each hole reveals several distinct layers, called *soil horizons*, which collectively are known as the *soil profile*. Each horizon is studied to see how it differs from others in the profile

and to learn the things about the soil that influence its capacity to support plant growth.

Color is normally related to drainage and the amount of organic matter in the soil. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration. Uniformly yellow, red, or brown lower layers normally indicate good drainage and good aeration.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Texture, or the relative proportions of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. It is later checked by mechanical analysis in a laboratory. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer and whether the soil is easy or difficult to cultivate.

Structure is the way the individual soil particles are arranged in larger aggregates, or peds, and the amount of pore (open) space between the aggregates. Structure indicates the ease or difficulty with which the soil is penetrated by plant roots, water, and air.

Other characteristics observed in field study and considered in classifying the soil are the depth of the soil over bedrock or compact layers; the presence of gravel or stones that may interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying material from which the soil developed; and the reaction (acidity or alkalinity) of the soil as measured by chemical tests.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified in phases, types, and series. The soil type is the basic unit of classification. A soil type may consist of several phases. Types that resemble each other in most characteristics are grouped in soil series.

Soil type.—Soils similar in kind, thickness, and arrangement of horizons, and having essentially the same texture in the surface soil, are classified as members of one soil type. The name of the soil type consists of the name of the soil series followed by the textural designation of the surface soil.

Soil phase.—Soil types are frequently divided into phases because of differences other than those in kind, thickness, and arrangement of horizons. Frequently, these differences are significant in managing the soil. Among the characteristics that suggest dividing a soil type into phases are variation in slope, frequency of rock outcrop, degree of erosion, and depth of soil over subsoil.

If the depth of sand in a soil type ranges from 3 to 4 or 5 feet, the type may be mapped as two phases—a typical phase, in which sand generally occurs below a depth of 42 inches, and a shallow phase, in which the sand is underlain by a fine-textured horizon at depths between 30 and 42 inches. If a soil type varies in degree of slope, a level phase may be mapped where the degree of slope is less than 2 percent; a very gently sloping phase is designated where the slopes are between 2 and 5 percent.

The soil phase (or the soil type if it has not been divided into phases) is the unit shown on the soil map. It is the unit that has the smallest range of characteristics. Use and management, therefore, can be specified more easily for it than for broader groups of soils that necessarily contain more variation.

Soil series.—Two or more soil types that are similar in kind, thickness, and arrangement of soil layers are normally designated as a soil series. In some places, however, a soil series may be represented by only one soil type. Each soil series is named for a place near which it was first mapped. For example, the Orlando series was first identified and mapped near Orlando in Orange County.

Miscellaneous land types.—Areas that have little true soil are not classified in types, phases, or series; they are identified by descriptive names. In Orange County the miscellaneous land types are Alluvial land, Borrow pits, Fresh water swamp, and Made land.

Undifferentiated soil groups.—If two or more soils that normally do not occur in regular geographic association are so intricately mixed that separate mapping is impractical, the soils are mapped together as an undifferentiated soil group. The group is named for the soils in it. An example in Orange County is Manatee and Delray soils, overflow phases.

Other soil terminology.—Definitions of other soil terms used in this report are given in Soil, the 1957 Yearbook of Agriculture (*8*).

Descriptions of Soils

This section contains descriptions of the soil series and the soil mapping units. After the name of each mapping unit is the letter symbol that identifies that particular soil on the detailed map in the back of this report. Use and management practices are discussed for each soil. In addition, the capability unit to which each soil belongs is shown. Each capability unit, or management group of soils, is described fully in the section, Management of Soils.

The principal characteristics of the soil series in Orange County are given in table 1. Table 2 shows the approximate acreage and proportionate extent of each mapping unit.

Symbols given in parentheses are Munsell color notations (*10*). They are used by soil scientists to evaluate soil colors precisely.

Adamsville Series

The soils of the Adamsville series have formed on moderately thick beds of sand that overlie marl or fine-textured materials. They occupy nearly level areas near the flood plain of the St. Johns River, which forms the eastern boundary of the county.

These soils have a medium acid or slightly acid (*10*) to neutral surface layer and nearly neutral to mildly alkaline lower horizons. They are somewhat poorly drained. The height of the water table fluctuates from shallow to deep. During the summer rainy season, the water table rises and saturates the subsoil to different levels. The subsoil remains saturated for long periods.

The Adamsville soils occur with the Leon, Immokalee, Keri, Parkwood, Pompano, Charlotte, Felda, Delray, and Manatee soils. They lack the organic pan that is char-

TABLE 1.—*Principal characteristics of the soil series*

Series	Relief	Drainage	Parent material	Surface horizons	
Adamsville	Level	Somewhat poor	Moderately thick deposits of sand over alkaline materials.	Gray to very dark gray fine sand, 4 to 8 inches thick.	Ligh yel yel sar bel
Blanton	Level to sloping	Somewhat excessive to moderately good.	Moderately thick deposits of sand.	Grayish-brown to dark gray or very dark gray fine sand, 4 to 8 inches thick.	Ligh fin lov de
Brighton	Level or depressed	Very poor	Remains of lilies, bonnets, and other aquatic plants over acid sand and clay.	Black to very dark brown mucky peat, 12 to 15 inches thick.	Brow fib to gra cla
Charlotte	Level or depressed	Poor	Moderately thick deposits of sand over alkaline materials.	Dark grayish-brown to very dark gray fine sand, 2 to 8 inches thick.	Ligh 12 br sa loa inc
Delray	Level or depressed	Poor to very poor	Moderately thick deposits of sand over alkaline materials.	Black to dark-gray fine sand or mucky fine sand, 9 to 20 inches thick.	Gray pla bel
Esto	Gently sloping and sloping.	Moderately good	Thin deposits of sand over acid, clayey materials.	Grayish brown to very dark gray fine sand, 3 to 6 inches thick.	Very fin inc lig an
Eustis	Level to very gently sloping.	Somewhat excessive to good.	Thick deposits of sand	Grayish-brown to dark-gray fine sand, 3 to 8 inches thick.	Stron yel de
Everglades	Level or depressed	Very poor	Remains of sawgrass, lilies, sedges, and grasses over alkaline sands and sandy clay.	Black to very dark brown mucky peat, 12 to 15 inches thick.	Brow fib 96 gra cla
Felda	Level or depressed	Poor to very poor	Thin deposits of sand over alkaline, clayey materials.	Grayish-brown to very dark gray fine sand, 3 to 8 inches thick.	Ligh les by gra sa
Immokalee	Level	Somewhat poor	Moderately thick deposits of sand.	Gray to very dark gray fine sand, 3 to 8 inches thick.	Ligh ve org de
Keri	Level	Somewhat poor	Sands stratified with a thin layer of marl.	Dark gray to very dark gray fine sand, 3 to 8 inches thick.	Ligh 12 lig thi lov
Lakeland	Level to strongly sloping.	Somewhat excessive to good.	Thick deposits of sand	Grayish-brown to dark gray or very dark gray fine sand, 3 to 8 inches thick.	Yello lov a d
Leon	Level to nearly level	Somewhat poor	Moderately thick deposits of sand.	Gray to very dark gray fine sand, 3 to 8 inches thick.	Ligh bla pa to sa bel

TABLE 1.—*Principal characteristics of the soil series*—Continued

Series	Relief	Drainage	Parent material	Surface horizons	
Manatee	Level or depressed	Poor to very poor	Thin deposits of sand over alkaline, clayey materials.	Black to dark-gray fine sandy loam or fine sandy clay loam, 9 to 18 inches thick.	Gray cla wit pla wit
Ona	Level	Somewhat poor to very poor.	Moderately thick deposits of sand and loamy sand.	Black to dark-gray fine sand, 6 to 12 inches thick.	Very bro tra pal dep
Orlando	Level to very gently sloping.	Somewhat excessive to moderately good.	Thick deposits of sand and loamy sand.	Black to dark-gray fine sand, 9 to 18 inches thick.	Pale- gra sar mo
Pamlico	Level or depressed	Very poor	Mixture of acid sand underlying remains of arrowheads, lilies, bonnets, sedges, and grasses.	Black muck, 12 to 60 inches thick.	Dark aci
Parkwood	Level	Somewhat poor	Moderately thin deposits of sand over a thick layer of marl.	Very dark gray to grayish-brown fine sand, 4 to 10 inches thick.	Gray un inc wh inc
Plummer	Level or depressed	Poor to very poor	Moderately thick deposits of sand.	Gray to very dark gray fine sand, 4 to 8 inches thick.	Ligh fin or
Pomello	Level to nearly level	Somewhat poor	Thick deposits of sand	Gray or light-gray fine sand, 2 to 6 inches thick.	Ligh bla pa de
Pompano	Level or depressed	Poor to very poor	Moderately thick deposits of sand over alkaline materials.	Grayish-brown to very dark gray fine sand, 3 to 8 inches thick.	Ligh pa ha be
Rutlege	Level or depressed	Poor to very poor	Moderately thick deposits of sand.	Black to dark-gray fine sand or mucky fine sand, 9 to 24 inches thick.	Gray br 30
St. Johns	Level	Somewhat poor	Moderately thick deposits of sand.	Very dark gray or black fine sand, 8 to 15 inches thick.	Gray bla pa inc
St. Lucie	Level to very gently sloping.	Excessive	Thick deposits of sand	Light-gray or gray fine sand, 1 to 4 inches thick.	Whit inc
Scranton	Level	Somewhat poor to poor.	Moderately thick deposits of sand.	Black to dark-gray fine sand, 9 to 15 inches thick.	Ligh pa sa mo

TABLE 2.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Adamsville fine sand	3,751	0.6
Dark colored surface phase	1,379	.2
Shallow phase	454	.1
Alluvial land	7,084	1.2
Blanton fine sand:		
Level high phase	14,369	2.5
Very gently sloping high phase	18,950	3.2
Gently sloping high phase	4,326	.7
Sloping high phase	2,118	.4
Level low phase	16,169	2.8
Very gently sloping low phase	1,783	.3
Level shallow low phase	447	.1
Blanton and Esto fine sands, gently sloping and sloping phases	320	.1
Borrow pits	588	.1
Brighton mucky peat:		
Shallow phase	1,210	.2
Moderately deep phase	598	.1
Deep phase	422	.1
Very deep phase	965	.2
Charlotte fine sand	599	.1
Delray fine sand	3,891	.7
Shallow phase	1,353	.2
Delray mucky fine sand	380	.1
Eustis fine sand:		
Level phase	366	.1
Very gently sloping phase	565	.1
Everglades mucky peat:		
Shallow phase	904	.2
Moderately deep phase	1,618	.3
Deep phase	4,578	.8
Very deep phase	4,183	.7
Felda fine sand	532	.1
Fresh water swamp	31,327	5.3
Immokalee fine sand	21,687	3.7
Keri and Parkwood fine sands	410	0.1
Lakeland fine sand:		
Level phase	5,502	.9
Very gently sloping phase	26,507	4.5
Gently sloping phase	10,617	1.8
Sloping phase	2,874	.5
Strongly sloping phase	258	[1]
Leon fine sand	166,783	28.4
Level heavy substratum phase	1,071	.2
Very gently sloping heavy substratum phase	628	.1
Made land	288	[1]
Manatee fine sandy loam	967	.2
Manatee fine sandy clay loam	1,317	.2
Manatee and Delray soils, overflow phases	23,561	4.0
Ona fine sand	6,401	1.1
Orlando fine sand:		
Level phase	1,235	.2
Very gently sloping phase	655	.1
Pamlico muck	3,632	.6
Plummer fine sand	22,711	3.9
Pomello fine sand	26,521	4.5
Pompano fine sand	16,416	2.8
Shallow phase	1,968	.3
Overflow phase	1,279	.2
Rutlege fine sand	30,292	5.2
Shallow phase	247	[1]
Rutlege mucky fine sand	26,898	4.6
St. Johns fine sand	5,432	.9
St. Lucie fine sand	9,827	1.7
Scranton fine sand	1,071	.2
Urban areas	43,956	7.5
Total	[2] 586,240	100.0

[1] Less than 0.1 percent.

[2] In addition to the total land acreage, a total of 55,680 acres consists of lakes.

acteristic of the Leon and Immokalee soils. They also lack the layer of marl within 42 inches of the surface that is characteristic of the Keri and Parkwood soils. The Adamsville soils are better drained than the Pompano, Charlotte, Felda, Delray, and Manatee soils.

Adamsville fine sand (0 to 2 percent slopes) (Aa).—This soil occurs in fairly large areas northeast and southeast of Christmas. The vegetation consists principally of pine, gallberry, myrtle, huckleberry, saw-palmetto, runner oak, a few cabbage palmettos, and wiregrass and other grasses. The soil is fine sand to depths of more than 42 inches.

Profile description:

0 to 4 inches, dark-gray (10YR 4/1), nearly loose fine sand mixed with some light-gray fine sand; has a salt-and-pepper appearance in many spots because of mixing of light-colored and dark sands.
4 to 14 inches, light-gray (10YR 6/1), loose fine sand.
14 to 26 inches, light yellowish-brown (10YR 6/4), loose fine sand.
26 to 36 inches, yellowish-brown (10YR 5/6), loose fine sand.
36 to 48 inches, mottled gray (10YR 5/1) and yellowish-brown (10YR 5/6), loose fine sand.

The surface soil ranges from gray to very dark gray in color and from 4 to 8 inches in thickness. The lower horizons range from light gray or very pale brown to yellowish brown and brownish yellow. In places a layer stained brown with organic matter occurs between depths of 18 and 40 inches. Small depressions in which the soil materials are similar to those of the Pompano or Charlotte soils occur in some areas.

The surface soil is low in organic matter and in essential plant nutrients. It is very permeable to air, water, and roots. The water-holding capacity is low, and the soil may become droughty during dry seasons.

Use and management.—Most of this soil is in native pasture or forest. The native vegetation furnishes only fair to poor grazing for cattle; between 10 and 25 acres of range are needed to supply grazing for 1 cow per year. Some native pastures are burned under controlled conditions to kill old grass and to permit the growth of more succulent plants. Pine trees make fair to good growth.

The suitability of this soil for crops is limited somewhat by low fertility, by rapid leaching, and, during dry years, by droughtiness. Nevertheless, with proper management, the soil can be improved greatly for crops and improved pasture. A rotation consisting of grass and cultivated crops is needed.

Because the water table is at shallow depths, this soil is suited to specialized truck crops and improved pastures. In other counties large tracts of this soil are used successfully to grow tomatoes, cabbage, sweet corn, cucumbers, peppers, lettuce, eggplant, green beans, cauliflower, strawberries, and watermelon. Pangolagrass, Pensacola bahiagrass, bermudagrass, and other improved

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pasture grasses, as well as Hubam clover, white clover, and other legumes, are suitable for improved pastures.

For good yields of suitable crops, the ground water must be controlled and fertilizer and lime used when needed. Hairy indigo, sesbania, and other cover crops can be grown during the summer to supply the humus and nitrogen needed for the truck crops that are to follow. If the soil is left bare, strong winds may cause erosion; small seedlings may be cut or damaged by windblown sand. (Capability unit IVsw–2.)

Adamsville fine sand, dark colored surface phase (0 to 2 percent slopes) (Ac).—This soil has a thicker, darker surface layer than Adamsville fine sand. The surface layer is black or very dark gray and ranges from 9 to 15 inches in thickness. It is like that of the Delray soils, but it is better drained.

Most of this soil is adjacent to the flood plain of the St. Johns River and is southeast of Christmas. A few small areas are about 3 miles west of Zellwood near the Lake County line.

This soil is suited to the same crops as are grown on Adamsville fine sand. Management of the two soils is about the same. (Capability unit IVsw–2.)

Adamsville fine sand, shallow phase (0 to 2 percent slopes) (Ab).—This soil differs from Adamsville fine sand in having finer textured material at depths of 30 to 42 inches. This material consists of gray or light-gray fine sandy clay loam that contains many, medium, distinct mottles. In a few areas fine sandy clay loam occurs at depths between 18 and 30 inches. Otherwise, the texture, color, and reaction of these two soils are essentially the same.

Most of this soil is southeast of Christmas. Nearly all of the areas have a stand of pine, saw-palmetto, cabbage palmetto, and gallberry, and a few vines and grasses.

This soil is suited to the same crops as are grown on Adamsville fine sand, and management is similar. (Capability unit IVsw–2.)

Alluvial Land

Alluvial land (0 to 2 percent slopes) (Ad).—This miscellaneous land type is composed of materials washed down from the uplands and deposited by some of the larger streams. The soil materials vary in color, texture, reaction, and depth. The color ranges from black to light gray; the texture, from fine sand to fine sandy clay; and the reaction, from strongly acid to neutral or mildly alkaline. In places the surface soil contains muck or peat. In some areas the soil material is underlain by limestone.

Because of the intricate pattern of the soil materials, the dense undergrowth, and the wetness of the areas, it was impractical to separate the soil materials into soil types and phases. Instead, they were mapped together as a miscellaneous land type. In most places the vegetation consists of shrubs, vines, cypress trees, hardwoods, and a few pine trees. Cabbage palmettos grow in a few areas.

Many narrow sloughs, depressions, and intermittent drainageways occur in an irregular pattern throughout the areas. These have been cut to various depths by flowing water, and so the relief is uneven. Most areas are poorly drained and are flooded during heavy rains. A few small areas are somewhat poorly drained, and these are flooded only when the streams are very high.

Use and management.—The suitability of this land type is limited by inadequate drainage, and none of it has been cleared for farming. The natural fertility of the soil materials ranges from poor to moderately good. Because of the hazard of floods and because other soils are more suitable, Alluvial land is not desirable for improved pastures or crops. The natural vegetation provides poor to fair grazing for livestock and food and shelter for wildlife. Some of the trees can be harvested for merchantable timber. (Not classified as to capability.)

Blanton Series

The soils of the Blanton series have formed from moderately thick deposits of unconsolidated sand. Typically, their lower horizons are colored pale yellow or light gray, or are splotched with pale yellow, light gray, or white. The natural vegetation includes bluejack, turkey, and live oaks, pine, runner oak, wiregrass, and a few saw-palmettos.

These strongly acid soils occur with the Lakeland, Eustis, Pomello, Leon, Orlando, and Scranton soils. They differ from the Lakeland and Eustis soils in having a subsoil that is grayer and not so yellow or strong brown. In addition, they have generally weaker relief and less rapid drainage in places. The Blanton soils have a stronger pale-yellow subsurface horizon and lack the organic pan of the Pomello and Leon soils. They have a thinner, lighter colored surface layer than the Orlando and Scranton soils.

Several phases of Blanton soils are mapped in this county. The high phases occur in association with the Lakeland and Eustis soils and are somewhat excessively drained to well drained. The low phases are on low ridges or knolls near the Pomello or Leon soils or are surrounded by those soils; they are moderately well drained and have a fluctuating water table that is near the surface for brief periods and at times is very deep in the soils.

Blanton fine sand, level high phase (0 to 2 percent slopes) (Ba).—This soil occurs in small to large areas, principally in the central, western, and northwestern parts of the county. It occurs with the Lakeland and Eustis soils, but it is lighter colored. It is somewhat excessively drained to well drained.

Profile description:

0 to 6 inches, dark-gray (10YR 4/1), nearly loose fine sand.
6 to 10 inches, gray (10YR 5/1), nearly loose fine sand.
10 to 48 inches, light brownish-gray (2.5Y 6/2), nearly loose fine sand containing a few pale-yellow and white splotches.

The surface soil ranges in color from dark gray to grayish brown and in thickness from 4 to 8 inches. In places, near the Lakeland soils, the material that underlies the surface soil is pale yellow to a depth of more than 48 inches. In many areas large splotches of light gray, white, or pale yellow occur at depths of 30 to 48 inches. In a few areas these colors occur in a layer of fine sandy clay loam that begins at depths between 30 and 42 inches.

This soil is loose and open, and roots and water penetrate easily. During dry seasons the soil becomes droughty and needs to have supplemental water applied

through irrigation. It is low in organic matter and in essential plant nutrients.

Use and management.—About 74 percent of this soil is used to grow citrus trees; 18 percent supports a stand of oak, pine, and other trees; 5 percent is in native or improved pastures; and 3 percent is cultivated. Other areas that have good air drainage could be cleared and planted to citrus trees. The soil responds readily to good management, including the use of fertilizer and, where needed, lime.

Strong winds may cause erosion in fields that lack a plant cover. Hairy indigo, Hubam clover, and other cover crops or a natural stand of weeds should be on the soil to prevent erosion. This cover will also increase the content of organic matter and will enable the soil to retain more moisture and plant nutrients. Strip-cropping also helps to prevent wind erosion. Because water penetrates the soil rapidly, accelerated erosion is not a problem.

A cropping system consisting of improved grasses and cultivated crops is suited to this soil. The grasses are grown for pasture for a few years and then are turned under. After that, cultivated crops are grown. (Capability unit IIIse–1.)

Blanton fine sand, very gently sloping high phase (2 to 5 percent slopes) (Bc).—Except for its stronger slopes, this soil is similar to Blanton fine sand, level high phase. Medium to large areas are in the central, western, and northwestern parts of the county.

A few areas have a layer of mottled light-gray, pale-yellow, and yellowish-brown fine sandy clay loam beginning at depths of 30 to 42 inches. In a small area adjacent to Rock Springs, phosphatic material is mixed with the other soil materials.

Air drainage on this soil is usually slightly better than on Blanton fine sand, level high phase. Surface runoff is medium. During heavy rains some soil may be washed from clean-cultivated fields.

Approximately 54 percent of this soil is in citrus trees, 33 percent is in forest, 11 percent is in native or improved pastures, and 2 percent is in cultivated crops. Additional areas could be cleared and planted to citrus trees.

Wherever feasible, fields should be cultivated across the slope, and a cover crop should be grown. A cover crop of legumes or a natural growth of weeds worked into the soil will increase or replenish the supply of organic matter and will enable the soil to retain more moisture and plant nutrients. The land should be cultivated so that some vegetation is left above the surface to reduce soil movement by wind and water. Alternate contour strips of cultivated crops and other plants prevent excessive erosion during windstorms.

Pensacola bahiagrass, pangolagrass, Alyceclover, and Hubam clover are suitable for improved pastures. During the dry season, from December through May, some of the pastures, citrus groves, and field crops need irrigation. The forests and the vegetation along the edges of fields and groves provide food and shelter for wildlife. Pine trees grow fairly well. (Capability unit IIIse–1.)

Blanton fine sand, gently sloping high phase (5 to 8 percent slopes) (Be).—Most of this gently sloping soil occurs on short slopes adjacent to lakes, ponds, and sinkholes in the western and northwestern parts of the county. The soil profile is similar to that described for Blanton fine sand, level high phase.

In a few citrus groves and in cultivated fields, some sand has washed down the slopes during hard rains or has been blown about during windstorms. In most places, however, the surface soil is darker colored and thicker than in adjacent areas of virgin soils. In a small area near Rock Springs, the profile contains some phosphatic material.

Nearly 50 percent of this soil is in citrus groves, 31 percent is in forests, 14 percent is in native or improved pastures, and the rest is used for cultivated crops. This soil has good drainage of air and water, so that additional areas could be cleared and planted to citrus trees. In a few places, however, cold air collects on the lower parts of the slopes and damages or kills the fruit trees.

Good management includes the use of fertilizer and lime when needed, the growing of cover crops, contour cultivation, and irrigation. For good yields of suitable crops, more intensive management is needed than on the less strongly sloping Blanton soils. (Capability unit IVse–1.)

Blanton fine sand, sloping high phase (8 to 12 percent slopes) (Bf).—This soil is similar to the other high phases of Blanton fine sand, but it has stronger slopes. Most of it occurs near sinkholes and lakes in the western and northwestern parts of the county. In some small areas near sinkholes, the slopes exceed 12 percent.

Several areas planted to citrus groves show evidence of the movement of soil down the slopes during heavy rains. Normally, the soil has good drainage of water and air. In a few areas, however, cold air collects on the lower parts of slopes and damages the fruit trees.

Approximately 52 percent of this soil is in citrus groves, 34 percent is in forests, 13 percent is in native or improved pastures, and the rest is used for cultivated crops or for homesites. Although the steepness of the slopes results in good air drainage, it causes soil to be washed down the slopes during heavy rains. A cover crop or a natural stand of weeds worked into the soil will increase the content of organic matter, enable the soil to retain more moisture and plant nutrients, and reduce the amount of runoff and erosion during heavy rains. The soil should be tilled on the contour and some plant materials allowed to remain on the surface. Lime, when needed, and liberal applications of fertilizer are necessary for good yields of crops; also, the soil needs irrigation for best yields. (Capability unit VIse–1.)

Blanton fine sand, level low phase (0 to 2 percent slopes) (Bb).—This soil is similar to Blanton fine sand, level high phase, but the lower part of the profile is light gray or nearly white. In addition, the soil is only moderately well drained instead of well drained. The water table fluctuates, but during the wet season it is within 30 inches of the surface.

This soil occurs on low ridges in the flatwood areas of the county. It is several inches to several feet higher than the surrounding or adjacent Leon and Pomello soils.

The surface soil is grayish brown to very dark gray. The lower horizons are light gray to very pale brown or are splotched or mottled with these colors and with pale yellow and white. The soil is low in organic matter and plant nutrients.

Several areas have a brown-stained layer, 3 to 9 inches thick, that begins at depths of 12 to 18 inches. These areas occur between areas of typical low phases of Blanton soils and the Leon soils or are surrounded by the Leon soils. The vegetation on these included areas consists of saw-palmetto, runner oak, and bluejack and turkey oaks.

Approximately 35 percent of this soil is planted to citrus trees, 40 percent is in forest, 21 percent is in native or improved pastures, and 4 percent is in cultivated crops. Additional areas are suitable for clearing and planting to citrus trees, cultivated crops, and improved pastures.

A cover crop worked into the soil will help replenish or increase the supply of organic matter and will enable the soil to retain more moisture and plant nutrients. If the soil is left bare, some of it may be blown away during severe windstorms. Frequent applications of fertilizer and lime are required for optimum yields of citrus fruits, other suitable crops, and improved pasture grasses.

A cropping system consisting of grasses and cultivated crops is suitable for this soil. Pensacola bahiagrass, pangolagrass, Coastal bermudagrass, white clover, Alyceclover, Hubam clover, and hairy indigo are suggested for improved pastures.

During extremely dry seasons, cultivated crops, citrus trees, and improved pastures will benefit from irrigation. Because the water table is near the surface during wet periods, roots of citrus trees may be damaged. Some areas have only fair air drainage and citrus groves are subject to damage by cold air. (Capability unit IIIse–2.)

Blanton fine sand, very gently sloping low phase (2 to 5 percent slopes) (Bd).—This soil is similar to Blanton fine sand, level low phase, but it occurs on stronger slopes. In small areas near streams and depressions, the slopes range from 5 to 8 percent. A few areas have a thin, brown-stained layer beginning at depths of 12 to 18 inches.

About 44 percent of this soil is in citrus groves, 31 percent is in forest, and 25 percent is in native or improved pastures. Because this soil has better air drainage than Blanton fine sand, level low phase, it is more suitable for growing citrus trees. Additional acreage can be cleared and used for that purpose.

Under good management, which includes applying fertilizer and lime liberally, citrus crops and other suitable crops yield well. A cover crop worked into the soil will help replenish or increase the content of organic matter and will enable the soil to retain moisture and plant nutrients.

A cropping system consisting of grasses and cultivated crops is suitable in areas used for field or truck crops. Tilling across the slope and stripcropping help prevent excessive movement of soil by hard rains and strong winds.

Pensacola bahiagrass, pangolagrass, Coastal bermudagrass, Hubam clover, Alyceclover, and hairy indigo are suitable for improved pastures. For high yields, large amounts of fertilizer and lime are needed. (Capability unit IIIse–2.)

Blanton fine sand, level shallow low phase (0 to 2 percent slopes) (Bg).—This soil occurs on low ridges in the flatwood areas of the county. It is similar to Blanton fine sand, level low phase, but it differs in having fine-textured material that begins at depths of 30 to 42 inches. This material consists of mottled light-gray, pale-yellow, and yellowish-brown fine sandy clay loam or fine sandy clay.

Approximately 69 percent of this soil is in citrus groves, 17 percent is in forest, 8 percent is in native pasture, and 6 percent is in improved pasture. A small part is in cultivated crops. If properly managed, the citrus groves produce fair to high yields. Shallow ditches may be needed in a few groves to remove excess surface water after hard rains. Fair yields of timber and other wood products are obtained from the pine trees. The natural vegetation of various kinds of grasses, sedges, and shrubs provides fair pasturage for cattle. If properly managed, the improved pastures produce high yields of forage.

This soil is similar to Blanton fine sand, level low phase, in productivity and in suitability for crops. It is also similar in fertilizer requirements and in other management needs. (Capability unit IIIse–2.)

Blanton and Esto Soils

Blanton and Esto fine sands, gently sloping and sloping phases (5 to 12 percent slopes) (Bh).—This undifferentiated soil group consists of Blanton fine sands and of Esto fine sands, which are not mapped separately in Orange County. Nearly all of it is in the western and northwestern parts of the county. In about 120 acres, the slopes range from 5 to 8 percent, and in about 200 acres, the slopes range from 8 to 12 percent. A few small areas have steeper slopes.

The Blanton soils have mottled light-gray, pale-yellow, yellowish-brown, and red fine sandy clay beginning at depths of 30 to 42 inches. The Esto fine sands have similar materials within 30 inches of the surface. In both soils the depth to the fine-textured materials varies greatly within short distances. In a few places the soil lacks the layer of fine sandy clay loam within 42 inches of the surface.

The profile of the Blanton soil is similar to that described for Blanton fine sand, level high phase. The following is a profile of Esto fine sand.

0 to 4 inches, dark-gray (10YR 4/1), loose fine sand.
4 to 18 inches, very pale brown (10YR 7/3), loose fine sand.
18 to 24 inches, light-gray (10YR 7/2) fine sandy clay loam with a few, medium, distinct, pale-yellow (2.5Y 8/4) mottles.
24 to 42 inches +, mottled light-gray (10YR 7/2), pale-yellow (2.5Y 8/4), and yellow (10YR 7/6) fine sandy clay loam that has a few streaks of red (10R 5/6).

The surface layer of the Esto soils ranges from grayish brown to very dark gray in color and from 3 to 6 inches in thickness. The 4- to 18-inch layer is very pale brown to yellow. In many places there is an abrupt transition from the sandy material to the clayey material; the depth to the clayey material ranges from 18 to 30 inches. In some areas most of the fine-textured material is red. In a few places it occurs at or near the surface; this is probably the result of several inches of sandy material having been lost through erosion.

Use and management.—Nearly all of the areas are used for citrus groves. The yields of fruit are high if fertilizer and lime are applied frequently and if other good management practices are followed.

These soils are suited to about the same crops as the Blanton fine sands. Contour cultivation reduces the amount of runoff and helps prevent erosion. A cover of plants, grown during the rainy season in summer, also helps to prevent runoff and to control erosion. A cover crop or a natural growth of weeds worked into the soils once a year will replenish and increase the content of organic matter and will help the soils retain moisture and plant nutrients. (Capability unit VIse–1.)

Borrow Pits

Borrow pits (Bp).—This miscellaneous land type consists chiefly of areas from which soil materials have been removed. The excavated material has been utilized for raising the level of areas used for roads, railroads, and building sites. Some of the pits are several hundred feet in width and in length and are from 10 to 40 feet deep. There is shallow water in some of them.

Most of the areas are 2 to 10 acres in size. Many of them consist of wasteland or have a cover of grasses, shrubs, and small trees. Others provide water for livestock. (Not classified as to capability.)

Brighton Series

The soils of the Brighton series have formed from the remains of sedges, lilies, bonnets, shrubs, grasses, and other aquatic plants and from the underlying acid sand and clay. The thickness of the organic material ranges from 12 to 96 or more inches. Generally, part of the material in the surface horizon is decomposed and is black in color. The lower organic horizons are generally fibrous and felty.

The Brighton soils occur with the Pamlico, Leon, St. Johns, Rutlege, and Plummer soils. They contain less mineral matter than the Pamlico soils, and the organic material is not so decomposed. The Brighton soils are more poorly drained and contain much more organic matter than the Leon, St. Johns, Rutlege, and Plummer soils. They differ from the Everglades soil in being strongly or very strongly acid instead of nearly neutral or alkaline.

Brighton mucky peat, shallow phase (Bj).—This soil occurs in fairly large areas, principally in the eastern and southern parts of the county. In most places the surface soil consists of black to very dark brown, nonfibrous organic material, 12 to 18 inches thick. This is underlain by brown fibrous peat. In places this layer is very thin; in others it is as much as 24 inches thick. It overlies gray or light-gray fine sand to fine sandy loam. The total thickness of the organic material is less than 36 inches.

Profile description:

0 to 10 inches, black (10YR 2/1), nonfibrous mucky peat.
10 to 30 inches, brown (7.5YR 4/4), fibrous felty peat; lower part of horizon consists of organic material mixed with sand.
30 to 48 inches +, gray (10YR 5/1) fine sand.

The surface soil ranges from black to very dark brown in color and from 12 to 18 inches in thickness. In places some fibrous material is noticeable in the surface soil; in other places the fibrous material is dominant. The color of the 12- to 30-inch horizon ranges from dark reddish brown to grayish brown.

Water covers this soil during most of the year and seldom is more than a few inches below the surface. If drained, the soil shrinks considerably at first and continues to recede through oxidation. It remains rapidly permeable to air and water but holds much water available to plants. This soil has a deep root zone when drained. It is high in nitrogen but deficient in many of the other essential plant nutrients.

Use and management.—Approximately 55 percent of this soil is used for native or improved pastures; a small percentage is in cultivated crops; 23 percent is covered by sedges, lilies, bonnets, and other aquatic plants; and 21 percent is in forests consisting mainly of gum, cypress, and bay trees. The native vegetation furnishes timber in addition to food and shelter for wildlife. The areas used for improved pastures and cultivated crops have been drained to some extent through shallow open ditches.

Control of the height of the water table is the principal management problem. With adequate water control, the soil is suitable for intensive use for vegetables and other cultivated crops and for improved pastures. If properly drained, it is easy to work and to keep in good tilth; heavy mechanized equipment can be used.

Liberal amounts of lime and a fertilizer that contains the minor elements are needed for high yields of crops and improved pastures. Pangolagrass, Pensacola bahiagrass, common bahiagrass, Coastal bermudagrass, caribgrass, white clover, and Hubam clover are suitable pasture plants.

Clearing the forested areas of this soil for pastures and crops is expensive. Also, the thinness of the organic layer limits the suitability of the soil for crops. After the areas have been drained, rapid oxidation further reduces the thickness of the organic material.

When the soil is dry and bare, some of the surface soil may be blown away during strong windstorms. As the organic material compacts and shrinks, the soil subsides, or sinks. This makes it difficult to maintain the proper level of water in the ditches. When cleared areas are not being used for crops or pastures, the water table should be kept near the surface to reduce the subsidence of the organic material. (Capability unit IIIws–4.)

Brighton mucky peat, moderately deep phase (Bk).—This soil occurs principally in the eastern and south-central parts of the county. It differs from Brighton mucky peat, shallow phase, in having a thicker layer of organic matter. The organic matter is 36 to 60 inches thick over mineral soil material. In many places the shallow phase occurs between areas of this soil and areas of mineral soils.

About 46 percent of this soil is in native or improved pastures, 29 percent is in forest, and 25 percent is in marshes. The improved pastures and many of the native pastures occur in areas that have been drained to some extent by ditches. The marshes contain sedges, lilies, bonnets, and other aquatic plants. The forests are made up of a dense stand of gum, cypress, bay, and other trees. The natural vegetation provides food and shelter for wildlife and timber for commercial use.

Controlling the height of the water table is an important management problem. In some of the larger areas near Lake Hart and Lake Mary Jane, drainage ditches remove much of the excess surface water. Other areas could be used for crops or improved pasture if they were partially drained or if the height of the water table were controlled. Control structures are needed in the ditches to regulate the height of the water table. When crops are not being grown, the water level should be kept near the surface to prevent oxidation and subsidence of the organic materials. The cost of dredging the ditches and of removing trees and shrubs should be considered in determining whether to reclaim additional areas.

Because it has a thicker layer of organic material, this soil is better suited to pasture crops and to other crops grown over a long period of time than Brighton mucky peat, shallow phase.

With adequate water control, fertilization and liming when needed, and other good management, good yields of improved pasture and of many vegetables and other truck crops can be obtained. Fertilizer containing the minor elements will benefit many kinds of crops. Pangolagrass, Pensacola bahiagrass, caribgrass, paragrass, white clover, and Hubam clover are suitable for improved pastures. (Capability unit IIIws–4.)

Brighton mucky peat, deep phase (Bl).—This soil resembles the shallow and moderately deep phases of Brighton mucky peat, but it has a thicker layer of organic material over the mineral soil material. The organic material ranges from 60 to 96 inches in thickness. This soil occurs with the other Brighton mucky peats, principally in the south-central part of the county. Much of it lies near the center of marshes.

Approximately 61 percent of this soil is in native and improved pastures, 36 percent consists of undrained marshes, and 3 percent is in forests. The improved pastures and most of the range pastures consist of marshes that have been partially drained.

This soil is well suited to truck crops, grasses, and legumes that tolerate a large amount of water. It is used in about the same way as the shallow and moderately deep phases of Brighton mucky peat, and its management is about the same. Because the deposit of organic matter is thicker, this soil probably will remain suitable for crops longer than the shallower Brighton soils. (Capability unit IIIws–4.)

Brighton mucky peat, very deep phase (Bm).—This soil has a thicker deposit of organic material than the other Brighton mucky peats. The organic material is more than 96 inches thick. Large areas of this soil occur near Lake Mary Jane and Lake Hart in the south-central part of the county. They are near the center of marshes, and most of them are surrounded by areas of other Brighton mucky peats.

Approximately 25 percent of this soil is in native or improved pastures, 44 percent consists of undrained marshes, and 31 percent is in forests. Use and management practices are similar to those described for the other Brighton mucky peats. (Capability unit IIIws–4.)

Charlotte Series

The soils of the Charlotte series occur on flat sloughs or in shallow basins. They have formed from moderately thick deposits of sand that overlie alkaline materials. The soils are poorly drained and have a high water table. If the water table is lowered, internal drainage is medium to rapid through the sandy horizons. These soils have a distinctive yellow to reddish-yellow subsoil. The subsoil begins at depths of 12 to 30 inches.

The Charlotte soils occur with the Adamsville, Keri, Leon, Immokalee, St. Johns, Pompano, Felda, and Delray soils. They differ from the Adamsville soils chiefly in being more poorly drained and in having brighter yellow colors in the lower horizons. They are more poorly drained and lack the marl layers of the Keri soils. They also lack the organic pan that occurs in the Leon, Immokalee, and St. Johns soils.

The Pompano and Felda soils differ from the Charlotte in having light brownish-gray or light yellowish-brown lower horizons; in addition, the Felda soils contain fine-textured materials at depths within 30 inches of the surface. The Delray soils have a darker, thicker surface layer than the Charlotte, and they lack the bright yellow coloring.

Only one soil of the Charlotte series, Charlotte fine sand, occurs in Orange County.

Charlotte fine sand (Ca).—This soil is in the eastern part of the county, principally east and southeast of Christmas. It occurs on flats or in shallow basins. Water from higher lying soils accumulates in some of the areas. The upper part of the profile is strongly acid to neutral, and the lower part is slightly acid to mildly alkaline. The natural vegetation consists of a sparse to moderate stand of coarse grasses, sedges, rushes, cabbage palmetto, pine, and a few clumps of saw-palmettos. Locally, the cabbage palmetto and pine may be lacking.

Profile description:

0 to 5 inches, dark grayish-brown (10YR 4/2), nearly loose fine sand.
5 to 16 inches, light brownish-gray (2.5Y 6/2), loose fine sand.
16 to 30 inches, brownish-yellow (10YR 6/8), loose fine sand.
30 to 40 inches, yellowish-brown (10YR 5/6), loose fine sand that contains thin streaks of yellow and pale yellow.
40 to 48 inches +, pale-brown (10YR 6/3), loose fine sand that contains many, medium, prominent, yellow and light-gray mottles.

The surface layer is grayish brown to very dark gray and is 2 to 8 inches thick. Generally, it is lighter colored near the outer edges of the soil areas. In these places the horizon just below the surface layer is light gray to depths of 15 to 24 inches; below this is the brownish-yellow horizon. The third horizon of the typical soil ranges from brownish yellow or reddish yellow in color and from 12 to 30 inches in thickness. It overlies sandy materials that become lighter colored with increasing depth. In places a few iron concretions occur in the lower part of the highly colored horizon, which lies at depths between 30 and 40 inches. Fragments of limestone or marl occur in places below this horizon. A small acreage consists of mottled light-gray, yellow, yellowish-brown, and brownish-yellow fine sandy loam or fine sandy clay that begins at depths of 30 to 42 inches.

This soil is low in organic matter and plant nutrients.

It is sandy and porous, and air and water move rapidly through the profile. Movement of water is retarded during seasons when the water table is near the surface. Because of the excess water, plant roots penetrate to only shallow depths, even though the soil would permit them to go deeper. The ability of the soil to retain moisture and plant nutrients is low.

Use and management.—Approximately 6 percent of this soil is in improved pastures, 21 percent is in native pastures, and 73 percent is in pine forests. If well managed, the improved pastures provide good grazing. Pastures of natural grasses and other plants provide only a fair amount of forage. The pine trees are small and yield only a small amount of timber. The natural vegetation provides food and shelter for wildlife.

This inextensive soil is intricately associated with Pompano fine sand. It is used and managed in about the same way. (Capability unit IVws–2.)

Delray Series

The soils of the Delray series have formed from moderately thick deposits of sand that overlie alkaline materials. They occur in slight depressions, sloughs, or swamps, and, as a result, they contain an accumulation of organic matter. These soils have a thick, black or very dark gray surface soil and a nearly neutral or mildly alkaline subsoil. The profile consists of sand to depths of more than 30 inches. The Delray soils are poorly drained to very poorly drained and are covered with water for many months during and after the rainy season in summer.

The Delray soils occur with the Pompano, Felda, Charlotte, Manatee, Adamsville, Keri, Leon, Immokalee, and St. Johns soils. They have a thicker, darker surface layer than the Pompano, Felda, and Charlotte soils; are coarser textured to greater depths than the Manatee soils; and are more poorly drained than the Adamsville, Keri, Leon, Immokalee, and St. Johns soils. The Delray soils are less acid than the Rutlege soils. The surface soil ranges from slightly acid to neutral, and the lower horizons are nearly neutral or mildly alkaline.

Delray fine sand (0 to 2 percent slopes) (Da).—This soil occurs on low, flat areas, principally northeast, east, and southeast of Christmas. Some areas are in saucer-like depressions that are surrounded by areas of Pompano, Charlotte, Adamsville, and Leon soils. Most areas have a dense stand of swamp maple, gum, ash, cypress, cabbage palmetto, and other water-tolerant trees. Other areas have a growth of pickerelweed, dollarplant, water iris, sedges, water-tolerant grasses, and other aquatic plants. In contrast to the other Delray soils, which have clayey material beginning at depths of 30 to 42 inches, this soil consists of sand to depths of more than 42 inches.

Profile description:

0 to 12 inches, black (10YR 2/1) fine sand mixed with a large amount of well-decomposed organic matter.
12 to 18 inches, very dark gray (10YR 3/1), nearly loose fine sand.
18 to 36 inches, gray (10YR 5/1), nearly loose fine sand.
36 to 48 inches +, light-gray (10YR 7/2), nearly loose fine sand with a few, fine, distinct, yellow and gray mottles.

The surface soil is generally black or very dark gray and is 9 to 20 inches thick. In a few places it is dark gray and is 12 to 20 inches thick. In many places there is an abrupt transition from the dark-colored surface soil to light-gray or gray soil material. In some places a grayish-brown horizon begins at depths of 30 to 42 inches.

Delray fine sand is fairly high in organic matter, but it is low in phosphorus and potassium. The center of many areas is slightly lower than the outer edges and contains the greatest amount of organic matter. The reaction of the soil is influenced somewhat by the movement of alkaline water through the profile. Most areas receive surface runoff and seepage from adjacent soils. The water table is at shallow depths and saturates the soil so that most areas are constantly wet. If the level of the water table is lowered, the soil is rapidly permeable to air and moisture and permits deep penetration of roots. The water-holding capacity is moderate.

Use and management.—Nearly 86 percent of this soil is in forest, and 14 percent is in native and improved pastures. Less than a hundred acres have been drained to some extent and planted to improved grasses. The natural vegetation provides fair grazing; between 10 and 20 acres are needed to support a cow and a calf during the year. The forests supply some timber. Most areas provide shelter and food for wildlife. Many areas are natural water reservoirs.

If this soil is to be used for crops or pastures, adequate drainage is essential. The water-control system should remove the excess surface water and provide subirrigation or overhead irrigation of crops and improved pastures. Frequent applications of fertilizer and lime are needed.

In reclaimed areas, sesbania, hairy indigo, and other cover crops or a natural growth of weeds worked into the soil will increase the supply of organic matter and enable the soil to retain more moisture and plant nutrients.

This soil is suited to a grass-vegetable cropping system. This system consists of growing improved grasses several years for pasture between the periods when vegetables and other truck crops are grown. Pangolagrass, Pensacola bahiagrass, common bahiagrass, Coastal bermudagrass, caribgrass, paragrass, hairy indigo, white clover, and Hubam clover are suitable for improved pasture. (Capability unit IIIws–2.)

Delray fine sand, shallow phase (0 to 2 percent slopes) (Db).—Most of this soil occurs east and southeast of Christmas. It is similar to Delray fine sand, but the clayey materials begin at depths of only 30 to 42 inches. This fine-textured material consists of gray or light-gray fine sandy loam, fine sandy clay loam, and fine sandy clay that has common, medium, distinct mottles of yellow, yellowish brown, and light olive brown.

The upper horizons are slightly acid to neutral, and the lower horizons are generally neutral or mildly alkaline. Natural drainage is very poor; the internal movement of water is retarded by the fine-textured materials.

Approximately 63 percent of this soil supports a dense stand of trees, 26 percent is in native or improved pastures, and 11 percent is used for cultivated crops. The use and management are the same as for Delray fine sand. (Capability unit IIIws–2.)

Delray mucky fine sand (0 to 2 percent slopes) (Dc).—The surface layer of this soil contains much more well-decomposed organic matter than that of Delray fine sand. It consists of mucky fine sand that ranges from 6 to 15 inches in thickness. Beneath this is black or very dark gray fine sand that grades, with increasing depth, to lighter colored material. In some areas the lower part of the profile is grayish brown and resembles an organic-stained layer. In a small acreage this soil has mottled gray or light-gray, yellow, and light olive-brown fine sandy loam or fine sandy clay loam, which begins at depths of 30 to 42 inches.

The natural vegetation consists of water iris, pickerelweed, sedges, and grasses. In some places there is also bay, gum, cypress, myrtle, pine, and cabbage palmetto.

After heavy rains the soil is covered with water, but during seasons of low rainfall the soil dries out for a short time. Most of this soil occurs at slightly lower elevations and remains wet longer than Delray fine sand. The mucky material in the surface soil is made up of decomposed plant remains.

Approximately 60 percent of this soil is in native pasture and marshes, and 40 percent is in forest. Most areas serve as reservoirs for water and as wildlife habitats. When the level of the water table is low, the native vegetation furnishes some forage for cattle.

This is one of the most productive soils in the county if adequate water control and other good management practices are used. It can be used and managed about the same as Delray fine sand. (Capability unit IIIws–2.)

Eustis Series

Soils of the Eustis series have formed in thick deposits of sand on level to gently sloping uplands. They are distinguished by a grayish-brown to dark-gray surface soil and a strong-brown to yellowish-red subsoil.

These soils are somewhat excessively drained to well drained and are very permeable to water, air, and roots. They are strongly acid. The native vegetation consists of turkey, bluejack, and live oaks, pine, a few saw-palmettos, and grasses.

The Eustis soils occur with the Lakeland and Blanton soils. They have red and brown coloring in the lower horizons, in contrast to the yellows and yellowish browns of the Lakeland soils and the light grays and pale yellows of the Blanton soils.

Eustis fine sand, level phase (0 to 2 percent slopes) (Ea).—This nearly level soil occurs chiefly in the western and northwestern parts of the county. In most places it consists of fine sand to depths of more than 72 inches, but in some places finer textured materials occur at depths of 42 to 72 inches.

Profile description:

0 to 6 inches, dark grayish-brown (10YR 4/2), nearly loose fine sand.
6 to 24 inches, strong-brown (7.5YR 5/8), loose fine sand.
24 to 48 inches +, yellowish-red (5YR 5/8), loose fine sand.

The surface soil ranges from grayish brown to dark gray in color and from 3 to 8 inches in thickness. The two lower horizons range from strong brown and reddish yellow to yellowish red. In a few places the soil contains large amounts of medium sand.

This soil is low in organic matter and plant nutrients. It is loose and porous; water moves rapidly downward and quickly leaches out some of the plant nutrients. Runoff is slow because of the gentle slopes and the ability of the soil to absorb water readily.

Use and management.—Nearly all of this soil is in citrus groves, but oaks and pines grow on a few acres. Under a high level of management, which includes liming when needed and the frequent application of fertilizer, citrus trees produce good yields. The trees need irrigation during extremely dry seasons.

Cover crops worked into the soil help replenish or increase the supply of organic matter and enable the soil to retain moisture and plant nutrients. Some of the residues from the cover crop should be left on the surface to retard the movement of soil during strong windstorms. Hairy indigo or a natural growth of weeds is commonly used as cover in citrus groves. (Capability unit IIIse–1.)

Eustis fine sand, very gently sloping phase (2 to 5 percent slopes) (Eb).—This soil has stronger slopes than Eustis fine sand, level phase. In most places the slopes are between 2 and 5 percent. A few small areas with steeper slopes are included. This soil occurs in the western and northwestern parts of the county, adjacent to Eustis fine sand, level phase, and the Lakeland soils.

The content of organic matter and plant nutrients is low. Water enters the soil at a fairly rapid rate, but because of the stronger slopes, runoff is more rapid on this soil than on the level phase. During hard rains, excessive runoff from strongly sloping, clean-cultivated fields causes sheet and gully erosion.

About 72 percent of this soil is in citrus groves, 15 percent is in forest, 11 percent is in improved pasture, and 2 percent is in cultivated crops. Good yields of citrus crops are obtained if fertilizer is applied frequently, lime is added when needed, the soil is irrigated, a cover crop is grown, and tillage is on the contour. (Capability unit IIIse–1.)

Everglades Series

The soils of the Everglades series have formed from the remains of sawgrass and other sedges, lilies, myrtle bushes, and grasses that overlie nearly neutral or alkaline sands and sandy clays. They occur on flats or in depressions, chiefly north of Lake Apopka. The soils are naturally very poorly drained and are covered with water for many months of the year.

These soils have a black or very dark brown surface layer of fibrous and nonfibrous mucky peat that overlies brown to dark reddish-brown, fibrous peat. The thickness of the organic materials ranges from 12 to more than 96 inches.

The Everglades soils occur with the Delray, Manatee, Pompano, Felda, and Leon soils, all of which are better drained and are mineral soils. In contrast to the Brighton soils, which are strongly to very strongly acid, the Everglades soils are slightly acid to mildly alkaline.

Based on the different thicknesses of the organic materials, four Everglades mucky peats have been mapped in Orange County.

Everglades mucky peat, shallow phase (Ec).—This nearly level soil occurs adjacent to mineral soils. It is

mainly west of Apopka, near Lake Apopka, along the outer boundary of the area of organic soils. It is also in small depressions in the south-central part of the county.

The thickness of the organic materials ranges from 12 to about 36 inches. In general, the organic materials are less fibrous and more decomposed in the thinner profiles. In many areas the surface soil is composed of black or very dark brown, nonfibrous mucky peat. In some places it consists of large amounts of fibrous materials mixed with decomposed organic matter. Generally, the surface layer is underlain by fibrous felty peat containing a small amount of well-decomposed organic matter.

Profile description:

0 to 10 inches, black (10YR 2/1) mucky peat.
10 to 20 inches, dark reddish-brown (5YR 2/2), fibrous peat.
20 to 34 inches, brown (7.5YR 4/4), fibrous peat; contains some sand in the lower few inches.
34 to 48 inches +, dark-gray (10YR 4/1), calcareous fine sandy clay loam.

In virgin areas the surface layer is dark brown and is only a few inches thick. It contains less decomposed organic matter than the surface layer in reclaimed areas. The underlying mineral materials consist of sand, sandy clay loam, marl or limestone, or a mixture of these materials.

This soil has a fairly large amount of nitrogen but is low in other essential plant nutrients. The water table is at shallow depths. Unless it is removed through artificial drainage, water remains on or near the surface during most of the year. Excessive drainage may result in rapid oxidation and in subsidence of the organic materials. Therefore, when the reclaimed areas are not in crops or improved pasture, the water table should be kept near the surface. When the soil is drained adequately, the organic horizons are rapidly permeable to air and moisture and are readily pervious to roots. The water-holding capacity is high.

Use and management.—Approximately 47 percent of this soil is used for vegetables and other truck crops, 43 percent is in native vegetation, and 10 percent is in native or improved pastures. Nearly all of the cultivated areas are near Zellwood and Plymouth. They are used along with areas of other Everglades mucky peats to grow vegetables and other truck crops (fig. 2).

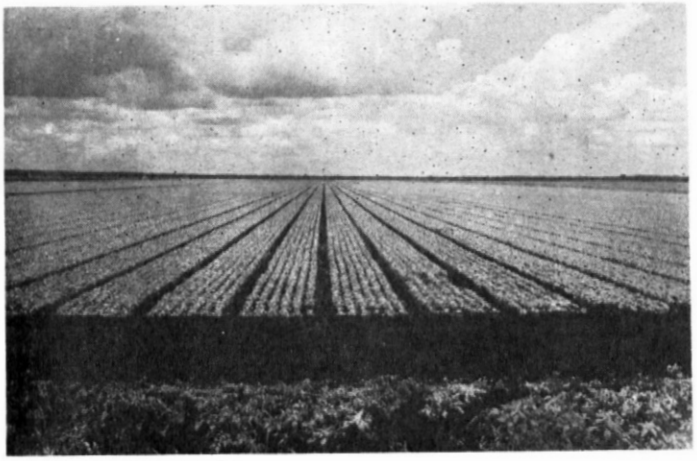

Figure 2.—Radishes growing on Everglades mucky peat.

During the winter, lettuce, endive, escarole, celery, cabbage, radishes, romaine, and other hardy crops that tolerate cold weather are grown. Snapbeans, sweet corn, lettuce, radishes, and gladiolus and caladium bulbs are harvested in spring. The improved pastures furnish large amounts of forage for cattle.

Phosphorus, potassium, and several minor elements are supplied to growing crops and pastures by adding fertilizer at frequent intervals. Additional nitrogen is sometimes used for special crops grown during the winter.

Controlling the height of the water table is important in using this soil for crops or improved pasture. Generally, this can be done by constructing large ditches and canals that are equipped with water-control structures. Excess water in the canals is pumped into Lake Apopka. During dry periods water is pumped from the lake into the canals and from there into shallow ditches in the fields. In this way the water table is kept at the desired level. During the summer the water table is kept near the surface of the soil to retard oxidation and subsidence.

Under good management that includes the adequate control of water and the use of sufficient fertilizer, high yields of improved pasture and of vegetables and other truck crops are obtained. Sesbania or another cover crop is turned under annually to supply additional organic matter. Suitable pasture plants are pangolagrass, Pensacola bahiagrass, Coastal bermudagrass, caribgrass, paragrass, white clover, and Hubam clover. When the soil is dry and does not have a cover of plants, some of the organic matter is blown away by strong winds. During dry periods, fires may destroy some of the organic matter.

Uncleared areas are suitable for reservoirs or as wildlife habitats. When the water table is low, they are also suitable for limited grazing by cattle. (Capability unit IIIws–4.)

Everglades mucky peat, moderately deep phase (Ed).—This nearly level soil is mainly north of Lake Apopka. It has a thicker layer of organic materials than the shallow phase; the organic materials range from 36 to 60 inches in thickness. Generally, the surface layer is black or very dark brown to plow depth, but in uncultivated areas it is somewhat thinner and browner. The underlying organic horizons consist of brown to dark reddish-brown, fibrous, felty peat. Fine sand, fine sandy clay loam, and marl or limestone, or a mixture of these materials underlie the organic horizons.

Approximately 58 percent of this soil is used to grow vegetables and other truck crops each year; 22 percent is in native vegetation of myrtle bushes and other shrubs, sedges, and grasses; and 20 percent is in improved or native pastures. The areas in native vegetation could be cultivated if the system of water control used on the reclaimed area west of Zellwood and Plymouth were extended to these areas.

Because this soil adjoins other Everglades mucky peats, improving or reclaiming any of these soils may involve draining and controlling the water level of the adjoining soils. Under good management that includes controlling the water adequately and applying fertilizer, many specialized crops make high yields on this soil. The soil is also well suited to improved pasture. It is similar to the other Everglades mucky peats in suitability for crops,

in management requirements, and in yields. (Capability unit IIIws–4.)

Everglades mucky peat, deep phase (Ee).—This soil differs from the other Everglades mucky peats in that it has 60 to 96 inches of organic materials over the mineral soil. Most of it is north of Lake Apopka near the centers of areas of other Everglades mucky peats.

In cultivated areas the surface soil is black to very dark brown to depths of 10 to 12 inches. In areas covered by native plants, it is dark brown to very dark brown and is 6 to 9 inches thick. The underlying organic horizons range from brown to dark yellowish brown.

Approximately 78 percent of this soil is used to grow vegetables and truck crops; 12 percent is in improved pasture; and 10 percent is in native vegetation consisting of myrtle bushes and other shrubs, sedges, and grasses. If the system used to control the water on nearby areas were also used on this soil, the acreage in native vegetation could be reclaimed for crops or improved pasture. When the areas are drained, the rate of shrinkage and subsidence is great, but enough of the organic matter is left so that this soil can be cultivated for many years under a good system of management.

This soil is similar to the other Everglades mucky peats in suitability for crops, in management practices, and in yields. Uncleared areas are suitable for water reservoirs and wildlife habitats. When the water table is low, they are also suitable for limited grazing by cattle. (Capability unit IIIws–4.)

Everglades mucky peat, very deep phase (Ef).—This soil consists of organic materials that generally are 96 to 180 inches thick, but these materials in some areas are as much as 232 inches thick. It occurs with the other Everglades soils, north of Lake Apopka and west of Plymouth.

In cultivated areas the surface layer is black or very dark brown to depths of 10 to 12 inches. In areas that have not been cleared, the surface layer is somewhat thinner and browner and is less decomposed. The lower horizons are brown to dark yellowish brown.

About 70 percent of this soil is used to grow vegetables and other truck crops; 26 percent has a cover of shrubs, sedges, grasses, and other native plants; and 4 percent is in improved pasture.

Areas in native vegetation could be reclaimed by a system of water management, consisting of ditches and carefully controlled structures designed to regulate the height of the water table in the soils.

This soil is similar to the other Everglades mucky peats in suitability for crops, in management practices, and in yields. Uncleared areas are suitable for water reservoirs and as wildlife habitats. (Capability unit IIIws–4.)

Felda Series

The soils of the Felda series have formed from a thin deposit of fine sand. The fine sand overlies alkaline, clayey material that, in places, contains calcareous concretions or fragments of shells or limestone. These soils occur on flat, nearly level, or depressed areas in the flatwoods in the eastern part of the county.

The Felda soils have a surface layer of dark-gray to grayish-brown, nearly loose fine sand, 3 to 8 inches thick. The subsurface layer is light-gray, gray, or light brownish-gray, loose fine sand. Below this, beginning at depths between 18 and 30 inches, is light-gray, gray, and yellowish-brown fine sandy clay loam. These soils have medium acid to neutral surface and subsurface layers and nearly neutral or alkaline lower horizons. Runoff is very slow. Drainage down through the sandy horizons is medium to rapid where the fluctuating, very shallow water table has been lowered through artificial drainage. Under natural conditions, the soil may be covered with a few inches of water for several months and after the summer rainy season.

The Felda soils are associated geographically with the Adamsville, Keri, Leon, St. Johns, Pompano, Charlotte, Delray, and Manatee soils. They are more poorly drained than the Adamsville, Keri, Leon, and St. Johns soils. They contrast with the Pompano soils in having moderately fine textured material within 30 inches of the surface. They have a lighter colored, thinner surface layer than the Delray and Manatee soils.

Only one soil of the Felda series, Felda fine sand, occurs in Orange County.

Felda fine sand (0 to 2 percent slopes) (Fa).—This poorly drained soil occupies several areas southeast of Christmas. Some areas receive seepage from the surrounding higher soils and remain ponded because of the lack of natural outlets for drainage. In most places the natural vegetation is a sparse to moderate stand of pine, cabbage palmettos, saw-palmettos, waxmyrtle and other shrubs; sedges; and various kinds of grasses. A few areas have no trees.

Profile description:

0 to 5 inches, dark-gray (10YR 4/1), nearly loose fine sand.
5 to 15 inches, light brownish-gray (10YR 6/2), loose fine sand.
15 to 20 inches, light-gray (10YR 7/2), loose fine sand.
20 to 34 inches, gray (10YR 5/1), friable fine sandy clay loam with common, fine, distinct mottles of yellowish brown (10YR 5/8).
34 to 48 inches +, mottled light-gray (10YR 6/1), yellowish-brown (10YR 5/6), and light olive-brown (2.5Y 5/4) fine sandy clay loam that grades to fine sandy loam.

The surface horizon ranges from grayish brown to very dark gray in color and from 3 to 8 inches in thickness. In most places the sandy materials are between 18 and 30 inches thick, but in a few areas the finer textured materials occur at depths of 12 to 18 inches. The subsoil is generally fine sandy clay loam, but in some places it is fine sandy loam. In several places small concretions of iron and sandstone occur in the subsoil. In most areas, within close intervals, there are minor variations in the color and mottling of the soil material and in the thickness of the horizons.

This soil is low in organic matter and in plant nutrients. The sandy horizons are rapidly permeable to water and air, but, in the clayey horizons, the permeability is restricted. Roots penetrate the entire profile easily, but excessive moisture may restrict their growth.

Use and management.—More than 90 percent of this soil is in forest, and most of the rest is used for range pastures. A small part is in improved pastures, which are fenced. The native vegetation furnishes fair grazing for livestock and provides shelter and food for wildlife. Some timber is harvested for sale. Under natural con-

ditions the areas serve as water reservoirs for adjacent soils.

Water control is necessary if this soil is to be used for cultivated crops or improved pasture. A system of drainage ditches that can also be used for subirrigation is needed to control properly the level of the water table. Areas adjacent to large areas of other poorly drained soils require dikes unless these other soils are also to be developed.

With adequate water control, frequent application of fertilizer, and other good management practices, the soil is suited to many vegetables and other truck crops and to improved pasture. A suitable cropping system is one in which improved grasses and legumes are grown for pasture for a few years between vegetable crops. Pangolagrass, Pensacola bahiagrass, Coastal bermudagrass, caribgrass, white clover, and Hubam clover or annual sweetclover are suitable for improved pastures.

Under intensive management that includes adequate drainage, frequent application of fertilizer, and other good practices, citrus trees can be grown on this soil. In the drained areas of this soil in adjacent counties to the east, citrus trees are commonly planted on a ridge approximately 24 to 30 inches higher than the swales or ditches between the rows. During extremely dry seasons, the trees need irrigation. (Capability unit IIIws–3.)

Fresh Water Swamp

Fresh water swamp (Fs).—This miscellaneous land type is made up of low-lying, forested areas that are covered with water during most of the year. Most of it is in the eastern and southern parts of the county. Many of the areas serve as natural drainageways in the flatwoods.

The areas support a mixed stand of red and white bays, cypress, gum, oak, myrtle, and other trees and shrubs; vines; and ferns. Cabbage palmettos grow in a few areas in the eastern part of the county.

Because of the intermingling of different soil materials, the dense stand of vegetation, and the wetness of the land, it was not practical to map the different soil types and phases separately. The soil materials in different places resemble those of the soils of the Rutlege, Plummer, Delray, Manatee, Pompano, Felda, Charlotte, Pamlico, and Brighton series. A few small areas that have better drainage occur within the swamps.

The surface horizon ranges from dark gray to black in color and from fine sand to mucky peat in texture. The lower horizons generally are gray or light gray and range from fine sand to sandy clay in texture.

Use and management.—Forest products are harvested to some extent on this miscellaneous land type. The areas also serve as water reservoirs and provide food and shelter for wildlife. Most areas occupy low sites or sloughlike depressions that at times are covered with several feet of water. The height of the water table varies greatly, however, both seasonally and yearly, and at times the surface is dry. Nevertheless, it would be expensive to reclaim the areas for agriculture. Artificial drainage, furthermore, would remove the water from the natural reservoirs, and this water is needed on the better drained soils that surround these swamps. (Not classified as to capability.)

Immokalee Series

The Immokalee soils have formed in moderately thick deposits of marine sands. They occupy level or nearly level sites in the flatwoods and have a natural stand of many, low saw-palmettos and pines.

These soils have a thin, gray to very dark gray surface layer that is underlain by a leached horizon of light-gray fine sand. A dark-brown to black organic pan begins at depths of about 30 to 42 inches. The pan becomes lighter in color with increasing depth.

These soils are strongly acid to very strongly acid. They are somewhat poorly drained. Runoff is slow; internal drainage is medium to rapid if the height of the water table is lowered. The level of the water table fluctuates from shallow to deep.

The Immokalee soils occur with the Leon, St. Johns, Pomello, Ona, Plummer, and Rutlege soils. The associated soils differ from the Immokalee soils as follows: The Leon soils have an organic pan that occurs at shallower depths, or at depths between 14 and 30 inches; the St. Johns soils have a darker, thicker surface soil, and the organic pan commonly begins at depths between 14 and 30 inches; the Pomello soils have a lighter colored surface soil, and the organic pan occurs below a depth of 30 inches; the Ona soils have a darker, thicker surface soil and a horizon, stained brown with organic matter, within 14 inches of the surface; and the Plummer and Rutlege soils are more poorly drained and commonly lack organic pans.

Only one soil of the Immokalee series, Immokalee fine sand, is mapped in Orange County.

Immokalee fine sand (0 to 2 percent slopes) (Ia).—This nearly level soil is chiefly in the flatwoods in the eastern and southern parts of the county. A few areas in the western part occupy narrow strips between the Blanton soils, which are better drained, and the Rutlege and Plummer soils, which are more poorly drained. Some areas near ponds, lakes, and streams are very gently sloping, the slopes ranging from 2 to 5 percent. The native vegetation consists of pine, saw-palmetto, gallberry and huckleberry bushes, runner oak, and wiregrass and other grasses.

Profile description:

0 to 6 inches, dark-gray (10YR 4/1), nearly loose fine sand; has a salt-and-pepper appearance because light-gray grains of sand are mixed with the dark sand.
6 to 32 inches, light-gray (10YR 6/1), loose fine sand.
32 to 38 inches, very dark brown (10YR 2/2), weakly cemented organic pan of fine sand.
38 to 48 inches +, dark yellowish-brown (10YR 4/4) fine sand; grades to pale yellow with increasing depth.

The surface soil ranges from gray to very dark gray in color and from 3 to 8 inches in thickness. The organic pan is generally at depths between 30 and 42 inches, but in places it is below depths of 42 inches. In some places the pan is colored dark to depths of more than 48 inches. In some profiles an additional organic pan has formed a few feet below the upper pan. In a small area southeast of Rock Springs, there is a large amount of medium-textured sand throughout the profile.

The soil is low in organic matter and in all the essential plant nutrients. It has low natural productivity.

Runoff of excess surface water is slow. Internal drainage is slow to rapid, depending on the height of the water table. The organic pan is weakly to strongly cemented. It is harder when dry than when moist. The horizons above the pan are rapidly permeable to air and water and are easily pentrated by roots. Roots of only a few plants penetrate the pan layer. Several factors, both physical and chemical, make this layer generally unfavorable for root development. The sandy horizons above the pan are low in water-holding capacity.

Use and management.—Approximately 66 percent of this soil is in native pasture, 5 percent is in improved pasture, 1 percent is in cultivated crops, 3 percent is in citrus groves, and 25 percent is in forest. The natural vegetation provides poor to fair grazing for livestock. From 15 to 25 acres will supply enough forage for a cow and a calf for 1 year. Under good management, improved pastures furnish much more forage than the native pastures. Pine trees grow fairly well. If well managed, forests provide profitable yields.

Undrained areas are suitable for native and improved pastures. Nevertheless, a few ditches will benefit the improved pastures by removing excess surface water during rainy seasons and by transporting irrigation water during extremely dry seasons.

Pangolagrass, Pensacola bahiagrass, common bahiagrass, Coastal bermudagrass, white clover, Hubam clover, and hairy indigo are the principal plants on improved pastures. Under good management that includes applying fertilizer frequently and liming when needed, good yields of improved pasture are obtained.

Proper management of water is essential for good yields of cultivated crops. Draining off the excess surface water and maintaining the water table at the proper level are of primary importance in reclaiming areas for cultivation. A system of ditches with control structures is needed. During extremely dry seasons supplemental water can be furnished through overhead irrigation or through subirrigation. With adequate control of water, frequent application of fertilizer, and liming when needed, suitable crops should produce medium to high yields on this soil.

Sesbania, hairy indigo, a natural growth of weeds, or some other plant cover worked into the soil will increase or replenish the content of organic matter and will enable the soil to retain more moisture and plant nutrients. A close-growing crop grown in narrow strips in cultivated fields will retard the movement of sand during strong windstorms. (Capability unit IVsw–1.)

Keri and Parkwood Series

The soils of the Keri and Parkwood series have formed in moderately thin sands that overlie marl. The Keri soils have a thin layer of marl between layers of sand. The Parkwood have a thin, sandy surface layer underlain by a thick layer of marl.

These soils are somewhat poorly drained. Runoff is slow to medium because of the nearly level relief. The height of the water table fluctuates from shallow to deep. In places, where the level of the water table is controlled, internal drainage is medium to slow. The natural vegetation on the Keri soils is pine, saw-palmetto, cabbage palmetto, runner oak, shrubs, and grasses; on the Parkwood soils it is cabbage palmetto, live oak, water oak, vines, and shrubs.

The Keri and Parkwood soils occur with the Pompano, Charlotte, Felda, Delray, Manatee, Adamsville, Leon, Immokalee, and St. Johns soils. The Pompano, Charlotte, Felda, Delray, and Manatee soils are not so well drained as the Keri and Parkwood soils. In the Adamsville soils, sand extends to greater depths and the marl layer is generally lacking. The Leon, Immokalee, and St. Johns soils are strongly to very strongly acid and have organic pans.

In Orange County the Parkwood and Keri soils occur in small areas. Inasmuch as the soils of the two series are similar, they have been mapped together as an undifferentiated soil group.

Keri and Parkwood fine sands (0 to 2 percent slopes) (Ka).—These nearly level soils occur in the eastern part of the county. They are chiefly southeast of Christmas near State Highway 520. A little more than half of the total acreage consists of Keri fine sand.

The Keri soil has layers of fine sand above and below a thin layer of marl. The marl is 6 to 12 inches thick and begins at depths between 12 and 30 inches. The sandy surface layer is medium acid to neutral, and the lower horizons are mildly to strongly alkaline. In most places the soil is sparsely covered with pine, saw-palmetto, cabbage palmetto, and a few shrubs and grasses.

Profile description of Keri fine sand:

0 to 5 inches, dark-gray (10YR 4/1), nearly loose fine sand; has a salt-and-pepper appearance because light-gray grains of sand are mixed with the dark sand.
5 to 18 inches, light-gray (10YR 7/1), loose fine sand.
18 to 28 inches, light-gray (10YR 7/2) marl of fine sandy loam texture streaked with brownish yellow (10YR 6/6).
28 to 42 inches +, mottled light-gray (10YR 7/2), yellow (10YR 7/6), and brownish-yellow (10YR 6/8) fine sand.

The surface layer ranges from dark gray to very dark gray in color and from 3 to 8 inches in thickness. The sandy horizon immediately above the marl is not uniform in color and in places contains different shades of yellow and brown. In most places the marl begins at depths between 18 and 30 inches, but, in some small areas, it begins at a depth of about 12 inches. In places the marl has a texture of fine sandy clay.

The Parkwood soil consists of a thin mantle of sand that overlies a thick layer of marl. It has a dense growth of cabbage palmetto, water oak, live oak, and a few other hardwoods and pines, vines, shrubs, and a few large clumps of saw-palmettos.

Profile description of Parkwood fine sand:

0 to 6 inches, very dark gray (10YR 3/1) fine sand.
6 to 9 inches, dark grayish-brown (2.5Y 4/2), very friable loamy fine sand.
9 to 18 inches, grayish-brown (2.5Y 5/2), very friable loamy fine sand.
18 to 36 inches, light-gray (10YR 7/1) marl of fine sandy loam texture.
36 to 42 inches +, light-gray (10YR 7/1) marl of fine sandy loam texture; common, fine, distinct mottles of brownish yellow (10YR 6/6).

The surface layer ranges from very dark gray to grayish brown. The marl generally has a texture of heavy fine sandy loam or fine sandy clay loam. Generally, the

marl begins at depths of 18 to 30 inches, but in some places it begins at depths between 12 and 18 inches.

The Keri and Parkwood fine sands are low in organic matter and in essential plant nutrients. They are moderately low in natural fertility. Their sandy surface layers are rapidly permeable to air and water but are low in water-holding capacity. Roots penetrate the sandy horizons readily, but the water table generally restricts them to the area above the marl. The level of the water table fluctuates from shallow to deep.

Use and management.—Most of this undifferentiated soil group is in range that provides fair grazing for livestock. About 15 to 25 acres are needed to support a cow and a calf for 1 year. The vegetation also provides shelter and food for wildlife. Some timber is harvested for sale.

These soils are inextensive and of little agricultural importance in Orange County. (Capability unit Vws–2.)

Lakeland Series

The soils of the Lakeland series have formed from thick deposits of acid marine sands and loamy sands. They are on level to strongly sloping uplands. Because of their sandy, porous profiles, these soils are well drained to somewhat excessively drained. They are strongly acid throughout.

These soils consist of deep to very deep fine sands that overlie fine-textured materials. The sandy materials commonly extend to depths of 72 to 120 inches, but the depth to the fine-textured materials ranges from 42 to 240 inches.

The Lakeland soils occur with the Blanton, Eustis, and Orlando soils. The Blanton soils differ from the Lakeland in that they are paler and have a light-gray, very pale brown, or pale-yellow subsoil; the Eustis soils differ in having a strong-brown or yellowish-red subsoil; and the Orlando soils differ in having a darker, thicker surface layer.

Lakeland fine sand, level phase (0 to 2 percent slopes) (la).—This soil is in the western and northwestern parts of the county. The areas are level and are fairly large.

Profile description:

0 to 5 inches, dark grayish-brown (10YR 4/2), nearly loose fine sand.
5 to 12 inches, light yellowish-brown (10YR 6/4), loose fine sand.
12 to 48 inches +, brownish-yellow (10YR 6/6), loose fine sand.

The surface soil is grayish brown to very dark gray and is 3 to 8 inches thick. The subsurface layer is light yellowish brown to yellowish brown. In many places this layer is lacking and the surface layer lies directly above the brownish-yellow, yellow, or yellowish-brown subsoil.

This soil is low in organic matter and is low in fertility. It is porous and water penetrates rapidly. The water-holding capacity is low.

Use and management.—Approximately 73 percent of this soil is in citrus groves (fig. 3); 20 percent is in natural vegetation of turkey oak, bluejack oak, and pine; 5 percent is in improved or native pastures; and 2 percent is in cultivated crops. This soil is low in natural productivity. If it is managed properly, however, the citrus trees produce good yields. If the rainfall is plentiful and is distributed throughout the growing season and if suitable management is practiced, good yields are obtained from other crops and improved pastures. Because their roots penetrate deeply, Pensacola bahiagrass, common bahiagrass, and pangolagrass are commonly seeded in improved pastures. The areas under forest furnish a small amount of timber for sale and provide food and shelter for wildlife.

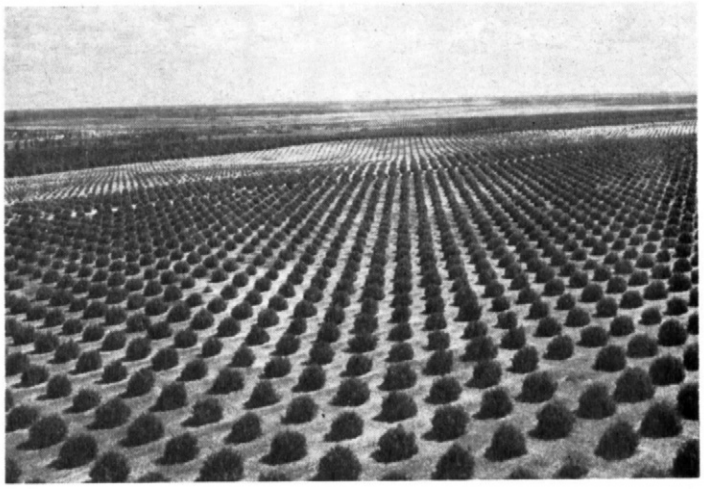

Figure 3.—**Citrus groves on slopes of 0 to 12 percent on the well-drained to somewhat excessively drained Lakeland, Eustis, and Blanton soils. Citrus groves occupy about 64,000 acres in Orange County.**

Additional areas that have adequate air drainage could be cleared and planted to citrus trees. The soil responds well to proper fertilizing and liming and to other good management practices. Hairy indigo, Hubam clover, or a natural growth of weeds should be grown in the groves. After the fruit has been harvested, the cover crop can be turned under. It will help to maintain or increase the supply of organic matter and to enable the soil to retain more moisture and plant nutrients. Some vegetation should be left above the ground or stripcropping should be practiced so as to retard the blowing of sand during windstorms. Because the soil absorbs rainwater rapidly, accelerated erosion is negligible. The soil is droughty, and irrigation is desirable for citrus crops, cultivated crops, and improved pastures. (Capability unit IIIse–1.)

Lakeland fine sand, very gently sloping phase (2 to 5 percent slopes) (lb).—This soil is more strongly sloping than Lakeland fine sand, level phase. The surface soil in many of the citrus groves and cultivated fields is darker and thicker than that in adjacent areas under forest.

This soil is porous and has only very gentle slopes. Therefore, much of the rainwater percolates through it. During intensive rains some water runs off areas that are clean cultivated and causes slight sheet erosion. This soil has better air drainage than Lakeland fine sand, level phase. Nevertheless, in the northern part of the county some of the citrus trees and cultivated crops are damaged when cold air accumulates on the lower slopes.

About 54 percent of this soil is in citrus groves; 35 percent is covered by native vegetation of turkey oak, bluejack oak, and pine; 8 percent is in improved or

native pastures; and 3 percent is in cultivated crops. Under good management high yields are obtained from most of the citrus groves.

The plants in improved pastures generally consist of Pensacola bahiagrass, common bahiagrass, and pangolagrass. The pastures provide good grazing if they are well managed. The forested areas furnish some timber for sale and provide food and shelter for wildlife.

Some of the forested areas that have adequate air drainage could be cleared and used to grow citrus trees. Under good management that includes adding liberal amounts of fertilizer, liming when needed, and growing cover crops, high yields of citrus fruits can be obtained on this soil. Hairy indigo, crotalaria, or a natural stand of weeds is used as a cover crop in the groves. Later, the cover crop is worked into the soil to replenish or increase the content of organic matter and to enable the soil to retain more moisture and plant nutrients. The cover of plants also retards runoff when rainfall is intensive and reduces erosion during severe windstorms. Tilling on the contour also helps to reduce the amount of runoff. During the dry months in spring, irrigation water benefits citrus trees, cultivated crops, and improved pastures. (Capability unit IVse–1.)

Lakeland fine sand, gently sloping phase (5 to 8 percent slopes) (lc).—This soil has stronger slopes than the level and very gently sloping phases of Lakeland fine sand. It occupies large areas in the western and northwestern parts of the county and occurs with the Eustis, Orlando, and Blanton soils and other Lakeland fine sands. In many of the citrus groves and cultivated fields, the surface soil is darker and thicker than that in the adjacent forested areas.

Because the slopes are gentle and the soil is porous, much of the rainfall is absorbed. Nevertheless, during intense rains, this soil erodes on bare slopes.

Approximately 54 percent of this soil is in citrus groves, 34 percent is in forests of oak and pine, and 9 percent is in improved or native pastures. Only about 3 percent is used for cultivated crops. Under good management high yields are obtained from most of the citrus groves.

Improved pastures of Pensacola bahiagrass, common bahiagrass, and pangolagrass furnish good grazing if rainfall is abundant and suitable management is practiced. However, this droughty soil is not so well suited to improved pasture as soils that have a shallower water table. Some timber is harvested for sale. If the soil is irrigated during the growing season and is otherwise well managed, fair yields of cultivated crops are obtained.

Additional areas that have adequate air drainage could be cleared and planted to citrus trees. Hairy indigo, crotalaria, or a natural stand of weeds grown between the trees will retard runoff during intensive rainfall and will reduce the amount of erosion. Tilling on the contour will also reduce runoff.

This soil is suited to watermelons and other specialized crops. (Capability unit IVse–1.)

Lakeland fine sand, sloping phase (8 to 12 percent slopes) (ld).—This soil has a profile similar to that of the other phases of Lakeland fine sand. Fairly large areas occur near sinkholes, lakes, and ponds in the western and northwestern parts of the county.

In cultivated areas the surface soil is darker and thicker than that in forested areas. In about 75 acres of this soil, distributed mainly in small areas, the subsoil is strong brown or yellowish red instead of the typical yellow, yellowish brown, or brownish yellow. Commonly, the sandy materials extend to depths of more than 72 inches, but small areas contain mottled yellow, red, and gray fine sandy clay loam, which begins at depths of 42 to 72 inches.

This soil is porous and sandy, and it absorbs rainwater rapidly. However, in citrus groves that lack a good cover of vegetation, there is much surface runoff and corresponding sheet and gully erosion. Air drainage is good in most areas, but cold air may accumulate on the lower slopes and injure the crops.

Approximately 53 percent of this soil is in citrus groves, 25 percent is in forests, 18 percent is in improved or native pastures, and 4 percent is in cultivated crops. Improved pastures provide good grazing, particularly during rainy seasons. Bahiagrass and other suitable grasses produce forage of high quality if the pastures are well fertilized and otherwise properly managed.

Additional areas in which air drainage is good could be planted to citrus trees. Tilling on the contour will keep soil from washing down the slopes during intense rains. A cover crop or a natural growth of weeds should be grown between the trees to reduce runoff and retard erosion. This can be worked into the soil once a year. The disking should be done in a way that leaves much of the vegetation on the surface for protection against erosion. It will thus replenish or increase the supply of organic matter and will enable the soil to retain more moisture and plant nutrients. (Capability unit VIse–1.)

Lakeland fine sand, strongly sloping phase (12 to 17 percent slopes) (le).—This soil has stronger slopes than the other Lakeland fine sands. The slopes are short; a few small areas have slopes of nearly 25 percent. This soil lies near sinkholes and lakes in the western and northwestern parts of the county.

This soil has a profile similar to that of the other Lakeland soils. In a few areas, however, the subsoil is strong brown or reddish yellow. In general, the sandy material is 72 or more inches thick, but in small areas, mottled yellow, red, and gray fine sandy clay loam begins at depths between 30 and 48 inches.

This soil is porous and sandy. Therefore, much of the rainwater percolates through it, and the moisture-holding capacity is low. Because of the strong slopes, runoff during intense rains may cause erosion on fields that are clean cultivated. Air drainage is good on the upper parts of the slopes. In winter, cold air may collect along the lower parts of the slopes and injure citrus trees and cultivated crops.

Approximately 48 percent of this soil is in citrus groves, 45 percent is in forests of pine and oak, and 7 percent is in improved pastures. If properly managed, the citrus trees produce good yields.

Pastures on this soil provide good grazing for cattle during only part of the year. Nevertheless, if rains are frequent and if good management is practiced, bahiagrasses produce forage of high quality. Trees make slow to moderate growth.

Citrus trees should be planted and cultivated on the contour. This will help to check erosion during intense

rains. A cover crop or a natural stand of weeds should be grown in the groves. (Capability unit VIse–1.)

Leon Series

The soils of the Leon series are nearly level and have formed from moderately thick deposits of marine sands. They occur in the flatwoods of the county.

These soils are strongly acid to very strongly acid. They are somewhat poorly drained. Runoff is slow. Internal drainage is medium to rapid, if it is not retarded by a shallow water table. The depth to the water table fluctuates from shallow to deep. The Leon soils support a stand of wiregrass, gallberry, huckleberry, runner oak, pine, and many low saw-palmettos (fig. 4).

***Figure 4.*—Native vegetation of wiregrass, saw-palmetto, gallberry bushes, and pine on Leon fine sand.**

These soils have a thin, gray to very dark gray surface layer; a light-gray or white, leached layer of fine sand; and a black to dark-brown organic pan that begins at depths between 14 and 30 inches.

The Leon soils occur with the Immokalee, St. Johns, Pomello, Ona, Plummer, Rutlege, Blanton, and Scranton soils. They differ from the associated soils in the following ways: The Immokalee soils have an organic pan beginning at greater depths, or at depths between 30 and 42 inches; the St. Johns soils have a darker, thicker surface soil and are more poorly drained; the Pomello soils have a lighter colored surface soil and an organic pan beginning at a greater depth, or at depths below 30 inches; the Ona soils have a darker, thicker surface soil and a brown, organic-stained horizon within 14 inches of the surface; the Scranton soils have a darker, thicker surface soil and lack the organic pan; the Plummer and Rutlege soils are more poorly drained and commonly lack the organic pan; and the Blanton soils occur at slightly higher elevations, are better drained, and lack the organic pan.

Leon fine sand (0 to 2 percent slopes) (lf).—This soil is level or nearly level. It is chiefly in the flatwoods in the eastern and southern parts of the county. Some areas in the western part of the county occur as narrow strips between the better drained Blanton and Lakeland soils and the more poorly drained Plummer and Rutlege soils. Small areas near ponds, lakes, and streams have slopes of 2 to 5 percent.

Profile description:

0 to 5 inches, dark-gray (10YR 4/1), nearly loose fine sand mixed with light-gray grains of sand; has a salt-and-pepper appearance.
5 to 18 inches, light-gray (10YR 7/1), loose fine sand.
18 to 20 inches, black (10YR 2/1) fine sand that is cemented with organic matter; firm to friable when moist, and hard when dry.
20 to 26 inches, dark-brown (10YR 3/3), weakly cemented fine sand.
26 to 48 inches +, brown or yellowish-brown (10YR 5/3 or 5/4) fine sand in upper part of horizon; transitional, with increasing depth, to light brownish-gray and light-gray (10YR 6/2 and 7/2) fine sand.

The surface soil ranges from gray to very dark gray in color and from 3 to 8 inches in thickness. The 18- to 20-inch layer, or organic pan, is black to dark brown and ranges from 2 to 6 inches in thickness. The upper part of the organic pan is generally dense and hard when dry. In some places the color of the pan is dark to depths of more than 42 inches. In places the organic pan is brown and is weakly cemented, or it may have no cementation.

The soil is low in organic matter. It is also low in natural fertility and in moisture-holding capacity. The level of the water table fluctuates. The water table is near the surface after heavy rains in summer and is at an approximate depth of 50 inches during the dry months of spring.

Use and management.—This soil, the most extensive in Orange County, occupies more than 28 percent of the land area. Approximately 63 percent of the acreage is in native pasture, 13 percent is in improved pasture, 22 percent is in forest, slightly more than 1 percent is in citrus groves, and less than 1 percent is in cultivated crops. Native pastures furnish poor to fair grazing; between 15 and 25 acres is needed to provide enough forage for a cow and a calf.

The acreage in improved pastures has increased greatly during the past 10 years. From 2 to 4 acres will supply enough forage for a cow and a calf. Pangolagrass, Pensacola bahiagrass, common bahiagrass, Coastal bermudagrass, white clover, Hubam clover, black medic clover, and hairy indigo are used in improved pastures. The forests consist principally of pine trees.

The acreage in citrus groves consists mostly of small areas within larger groves on better soils. It has usually been included in the groves to fill out rectangular plots. These trees seldom receive the special treatment needed and are not healthy. They make fair growth for a few years and then become stunted and die. Without special treatment such areas do not have a root zone favorable for citrus crops. Also, they occupy positions that are highly susceptible to frost in winter.

This soil is not well suited to citrus crops. Nevertheless, fair yields of fruit can be expected from selected areas that are managed intensively. The citrus groves need fertilizer frequently, lime, cover crops, and irrigation and artificial drainage (fig. 5). Drainage should be provided to depths between 36 and 48 inches. The trees need to be planted on beds or ridges so that the rooting area above the fluctuating water table will be adequate.

Areas that are drained naturally are suitable for improved pastures and for forests of pine. If properly managed, pine trees make fair growth. Improved pas-

Figure 5.—**Citrus grove on Leon fine sand. This soil requires intensive management for the production of citrus fruits. The area between the rows has been bedded and is drained by tile.**

tures furnish good yields of forage under suitable management.

Good management of water is important for good yields of cultivated crops as well as for improved pastures. Shallow ditches will remove the excess surface water during rainy seasons and will supply water through subirrigation during dry seasons. Control structures in the ditches will maintain the water table at a desired level. A system of overhead irrigation can also be used.

Under good management that includes controlling the water table, applying fertilizer frequently, and liming when needed, suitable crops will produce medium to high yields on this soil. A cover crop worked into the soil will replenish or increase the supply of organic matter and will enable the soil to retain more moisture and plant nutrients. A strip of close-growing plants grown in cultivated fields will help to check blowing sand during severe windstorms. A cropping system that consists of grasses alternated with vegetable crops is suitable. (Capability unit IVsw–1.)

Leon fine sand, level heavy substratum phase (0 to 2 percent slopes) (Lg).—Most of this soil is in the eastern part of the county. It differs from Leon fine sand chiefly in that it contains clayey materials at depths between 30 and 42 inches. An organic pan begins at depths ranging from 14 to 30 inches. The clayey materials generally consist of mottled, light-gray, yellow, and yellowish-brown fine sandy clay loam or fine sandy clay. In most places the upper part of the fine-textured material is strongly acid and the lower part, near a depth of 42 inches, is strongly acid to neutral.

Approximately 60 percent of this soil is in range pasture, 7 percent is in improved pasture, 24 percent is in forest, and 9 percent is in citrus groves. Management is somewhat similar to that described for Leon fine sand. (Capability unit IIIsw–1.)

Leon fine sand, very gently sloping heavy substratum phase (2 to 5 percent slopes) (Lh).—This soil is mainly in the eastern part of the county. It has stronger slopes than Leon fine sand. In addition, the organic pan is underlain by clayey materials, which are within 42 inches of the surface. The clayey materials consist of mottled light-gray, yellow, and yellowish-brown fine sandy clay loam or fine sandy clay. They are commonly strongly acid.

Approximately 65 percent of this soil is in native pasture, 1 percent is in improved pasture, 30 percent is in forest, and 4 percent is in citrus groves. The soil is used and managed somewhat like Leon fine sand. During the summer, when rainfall is intensive, a cover of plants should be grown on cleared areas to check erosion. (Capability unit IIIsw–1.)

Made Land

Made land (Ml).—This miscellaneous land type is made up of areas that have been filled by dredgings from the bottoms of ponds and lakes or by materials hauled from borrow pits. Most of the Made land is made up of a layer of these materials that is 12 to 18 inches thick. Many of the areas are used as building sites for houses and commercial buildings. A few acres are used to grow citrus trees that produce fair yields under good management. (Not classified as to capability.)

Manatee Series

The Manatee soils are on flats or in depressions, principally near the St. Johns River along the eastern boundary of the county. They have formed from a thin deposit of sand or loamy sand that overlies alkaline, clayey materials. In most places the clayey materials are underlain by marl. In the upper part of the profile, the soil is slightly acid to neutral. In the lower part, it is neutral to alkaline.

These soils are poorly drained to very poorly drained. Runoff is very slow or lacking. When the water table is not near the surface, drainage is slow to medium through the fine-textured horizons. Undrained areas may be covered with a few inches of water for many weeks.

The Manatee soils occur with the Delray, Felda, Pompano, Charlotte, Adamsville, Keri, Parkwood, Leon, and St. Johns soils. They have fine-textured materials within 30 inches of the surface, whereas the Delray soils have coarse-textured materials to a depth of 30 or more inches.

Other associated soils differ from the Manatee in the following ways: The Felda soils have a lighter colored, thinner surface layer; the Pompano and Charlotte soils have a lighter colored surface layer and are sandy to depths of more than 30 inches; the Adamsville soils are better drained and have a lighter colored, thinner surface layer; the Keri and Parkwood soils are better drained and lack the clayey materials overlying the marl layer; and the Leon and St. Johns soils are better drained, contain an organic pan, and are strongly acid to very strongly acid.

Manatee fine sandy loam and Manatee fine sandy clay loam are mapped in Orange County. In addition, the Manatee soils are mapped with the Delray soils as an undifferentiated soil group—Manatee and Delray soils, overflow phases.

Manatee fine sandy loam (0 to 2 percent slopes) (Ma).—This soil is in low, small- to medium-sized areas, principally east and southeast of Christmas. Most of the areas have a stand of water oak, live oak, gum, maple,

and other hardwood trees and cypress, cabbage palmetto, shrubs, and vines. Some areas have a cover of sawgrass, pickerelweed, sedges, grasses, and aquatic plants. The level of the water table fluctuates from above the surface during wet seasons to depths of 20 to 40 inches during dry seasons. Only a small acreage has been cleared, drained, and planted to cultivated crops and improved pastures.

Profile description:

0 to 10 inches, black (10YR 2/1), friable fine sandy loam; contains a considerable amount of organic matter.
10 to 20 inches, dark-gray (10YR 4/1), friable fine sandy loam.
20 to 30 inches, gray (10YR 5/1), friable fine sandy clay loam or fine sandy clay; contains a few, medium, distinct mottles of brownish yellow (10YR 6/8); moderate, medium, subangular blocky structure; plastic when wet, hard when dry.
30 to 42 inches +, gray (10YR 5/1) marl that has a texture of fine sandy clay loam.

The surface soil ranges from black to dark gray in color and from 9 to 18 inches in thickness. Although the surface soil is predominantly fine sandy loam, many small spots that have a surface layer of loamy fine sand are scattered throughout the areas. The subsoil ranges from fine sandy clay loam to fine sandy clay. The clayey materials commonly begin at depths between 18 and 30 inches. In places the marl layer is lacking within 48 inches of the surface. Beneath the clayey materials, the subsoil in places is stratified with coarser textured layers.

This soil is moderately high in productivity. It is high in organic matter and nitrogen and contains moderate amounts of plant nutrients. Its capacity for retaining moisture and plant nutrients is high. The water table is generally at shallow depths. Water and air move easily through the upper part of the profile and slowly through the clayey materials when the water table is low. During much of the year, most of the plant roots are confined to the upper horizons by an excessive amount of water.

Use and management.—About 71 percent of this soil is in wet woodland; 26 percent is in marshes or native pasture; and 3 percent is in improved pasture. Forests of oak, gum, cypress, and cabbage palmetto supply some timber and wood products that can be sold. If the marshes are not covered too deeply with water, they furnish fair to good grazing for cattle. If properly managed, the improved pastures supply good forage. Most areas provide shelter and food for wildlife.

Careful management of water is essential if this soil is to be used more intensively for agriculture. Because it adjoins other poorly drained and somewhat poorly drained soils, a plan to reclaim any one of the soils involves, to some extent, controlling the water table in adjoining soils. Ditches, dikes, control structures, and pumps may be needed for draining and regulating the level of the water table.

Pangolagrass, common bahiagrass, Pensacola bahiagrass, Coastal bermudagrass, paragrass, white clover, and Hubam clover are suitable for improved pastures. If fertilizer is applied and if the soil is well managed otherwise, good yields can be obtained from many suitable crops and from improved pastures. Tillage should be done when the soil is not too wet, so as to prevent clodding. Turning under sesbania, hairy indigo, or another cover crop helps to improve the workability of the soil and to replenish the supply of organic matter. (Capability unit IIIws-3.)

Manatee fine sandy clay loam (0 to 2 percent slopes) (Mb).—This soil occurs in medium-sized areas near the flood plain of the St. Johns River. It is nearly level; excess surface water drains off slowly. Some areas are covered by water for many months of the year. The level of the water table fluctuates from very shallow to deep. If the water table is not near the surface, moisture moves slowly downward through the fine-textured horizons.

Profile description:

0 to 9 inches, black (10YR 2/1) fine sandy clay loam; fine crumb structure; sticky and plastic when wet, hard when dry; small cracks form when the surface soil dries out.
9 to 22 inches, dark-gray (10YR 4/1) fine sandy clay loam; contains spots and streaks of gray; weak, medium, subangular blocky structure; sticky and plastic when wet, hard when dry.
22 to 36 inches, gray (10YR 5/1) fine sandy clay or heavy fine sandy clay loam with a few streaks of light gray; weak, medium, subangular blocky structure; sticky and plastic when wet, hard when dry.
36 to 42 inches +, light-gray (10YR 6/1) fine sandy clay loam or heavy fine sandy loam with a few, medium, distinct mottles of brownish yellow (10YR 6/6); contains a few pieces of soft limestone or marl.

The surface layer ranges from black to dark gray in color and from 9 to 18 inches in thickness. In places it is mucky because of the large amount of partly decomposed organic matter. The deeper horizons are stratified in many places, ranging from fine sandy clay to fine sandy loam in texture. In some areas the marl is absent or occurs in small pockets or lenses in the deeper horizons.

Manatee fine sandy clay loam is one of the more fertile soils in the county. It is high in many essential plant nutrients. The soil is slowly permeable to water and air. During much of the year it is so wet that plant roots are confined to the upper layers.

Use and management.—Approximately 93 percent of this soil is covered by a hammock type of vegetation, and 7 percent is in pasture or marsh. Only a few acres have been drained, cleared, and planted to improved pasture grasses. Most areas serve as reservoirs for water. These provide food and shelter for wildlife.

This soil is not well suited to cultivation because it is difficult to drain and can be plowed safely only within a narrow range of moisture conditions. It is well suited to improved pasture. In most places this soil is intricately associated with other poorly drained soils of coarser texture and is included with them in reclamation projects. Management practices for improved pasture are similar to those for Manatee fine sandy loam. (Capability unit Vws-1.)

Manatee and Delray Soils

Manatee and Delray soils, overflow phases (0 to 2 percent slopes) (Mc).—These poorly drained soils are mapped as an undifferentiated soil group because they are so intricately mixed that it was impractical to separate them at the scale of mapping used. They occur principally on the flood plains along the St. Johns and Wekiwa Rivers. The areas are dissected by several wind-

ing, interconnected meanders of old streams near the present channels.

The areas are almost at the same level as the banks of the streams and are flooded frequently; water covers the surface during several weeks of the year. Within the areas are slight depressions or sloughs. The soils have formed from the underlying alkaline materials and from sediments deposited by floodwaters from the adjacent streams. No large or significant amounts of sediments are now being deposited by the floodwaters.

This undifferentiated soil group is made up of Manatee loamy fine sand, fine sandy loam, and fine sandy clay loam and of Delray fine sand and loamy fine sand. In general, the soils of these two series have the main features of typical Manatee and Delray soils. The texture of the soil materials ranges from loamy sand to clay. Most of the coarser textured horizons are at or near the surface. The depth of the fine-textured materials varies greatly within short distances. In one place these materials may be on the surface, and nearby they may be at a depth of as much as 48 inches. In nearly all areas the surface layer is thick and dark. The Manatee soil has fine-textured materials beginning at depths within 30 inches of the surface. The Delray soil has sand or loamy sand to a depth of more than 30 inches. This is underlain by fine-textured materials.

In both soils the upper part of the profile is slightly acid to neutral and the deeper horizons are neutral to alkaline. In places the clayey materials are underlain at shallow depths by marl or limestone.

Use and management.—Near the St. Johns River, on approximately 66 percent of this undifferentiated soil group, is a natural stand of sedges, pickerelweed, water iris, lilies, and various wild grasses, which provide fair grazing for cattle. About 34 percent supports water oak, maple, gum, ash, and other hardwoods and cabbage palmettos. Many areas along the Wekiwa River in the northern part of the county are under forest.

Clearing the land, draining it, and controlling the floodwaters are the major requirements in reclaiming the areas for more intensive agriculture. If reclaiming the areas proves to be economically feasible, the soils would be well suited to several improved grasses and legumes; some areas would be suited to vegetables and other truck crops. (Capability unit Vws–1.)

Ona Series

The Ona soils are level to nearly level. They occur in the flatwoods. The soils have formed from moderately thick deposits of sands and loamy sands. They have a black to dark-gray surface layer, 6 to 12 inches thick, that is underlain by a brown or dark-brown, organic-stained horizon. This is transitional, with increasing depth, to lighter colored sand.

These soils are strongly acid. They are somewhat poorly drained to poorly drained. Runoff of surface water is slow. When the water table is not near the surface, the downward movement of water is moderate to rapid. The level of the water table fluctuates from shallow to deep.

The Ona soils occur with the Scranton, Blanton, Leon, Immokalee, St. Johns, Plummer, and Rutlege soils. The associated soils differ from the Ona soils in the following ways: The Scranton soils lack the brown, organic-stained horizon immediately below the surface layer; the Blanton soils are better drained and have a lighter colored, thinner surface layer; the Leon and Immokalee soils have a lighter colored, thinner surface layer and a light-gray, leached horizon between the surface layer and the organic pan; the St. Johns soils also commonly have a light-gray, leached horizon between the dark surface layer and the organic pan; and the Plummer and Rutlege soils are more poorly drained.

Ona fine sand is the only soil of the Ona series mapped in Orange County.

Ona fine sand (0 to 2 percent slopes) (Oa).—This soil occurs in small- to medium-sized areas, principally in the eastern, south-central, and northwestern parts of the county. Typically, it is at slightly lower elevations than the Scranton or Blanton soils or it lies between these soils and the Leon, Immokalee, and St. Johns soils. In the western part of the county, a few, long, narrow areas of this soil lie between well-drained Lakeland and Blanton soils and poorly drained Plummer and Rutlege soils. A few areas near lakes, ponds, and streams have slopes of 2 to 5 percent.

The native vegetation consists of pine, saw-palmetto, gallberry, myrtle bushes, runner oak, and other shrubs and grasses.

Profile description:

0 to 8 inches, black (10YR 2/1), nearly loose fine sand.
8 to 11 inches, very dark brown (10YR 2/2), nearly loose fine sand.
11 to 18 inches, brown (10YR 5/3), loose fine sand.
18 to 26 inches, light yellowish-brown (10YR 6/4), loose fine sand.
26 to 42 inches +, light-gray (10YR 7/2), loose fine sand with a few streaks of yellow (10YR 7/6).

The surface layer ranges from black to dark gray in color and from 6 to 12 inches in thickness. The organic-stained horizon is very dark grayish brown to brown and is within 14 inches of the surface. It is commonly 3 to 6 inches thick. The underlying horizons grade gradually, with increasing depth, to lighter colored material.

In a small acreage in the eastern part of the county, clayey materials begin at depths between 30 and 42 inches. These consist of mottled light-gray, yellow, and yellowish-brown fine sandy clay loam or fine sandy clay. If the soil is cultivated deeply, the brown, organic-stained horizon is mixed with the surface soil. The color of the resulting mixture is similar to that of the Scranton soil.

This soil has a moderate supply of organic matter. It also has a moderate supply of nitrogen, but it is deficient in other essential plant nutrients. Permeability is rapid. At times the water table is within a few inches of the surface, but in dry seasons it may recede to a depth of 50 inches. Normally, the soil retains enough moisture for crops. During extremely dry years, however, cultivated crops and citrus groves may need irrigation.

Use and management.—Approximately 39 percent of this soil is in native pasture, 27 percent is in forest, 16 percent is in improved pasture, and 14 percent is in citrus groves. The rest is used for cultivated crops. The native vegetation furnishes only a fair amount of forage for cattle; improved pastures, if well managed, provide about four times as much. The forests supply timber that can be sold as lumber, poles, pulpwood, or as other

wood products. Under good management fair to good yields of citrus fruits and other suitable crops can be obtained on this soil. Many groves and cultivated fields contain ditches for removing excess water during periods of intensive rainfall. Most areas provide shelter and food for wildlife.

If adequately drained, fertilized, limed when needed, and irrigated, additional areas, now in native pasture and forest, could be used for improved pasture or for citrus groves or other suitable crops. The level of the water table needs to be controlled less intensively for improved pasture than for citrus groves or cultivated crops. Citrus trees can be grown on areas that have been drained adequately and that have favorable air drainage. Sesbania, hairy indigo, and other cover crops should be grown in groves and in cultivated fields to maintain or increase the content of organic matter. Pensacola bahiagrass, common bahiagrass, bermudagrass, pangolagrass, white clover, and hairy indigo are suitable plants for improved pastures. (Capability unit IIsw–1.)

Orlando Series

The Orlando series is made up of level to very gently sloping soils that have formed from thick deposits of sand and loamy sand. The soils have a thick, dark-colored surface layer that has formed under good drainage conditions. Surface runoff is medium, and water moves rapidly downward through the soil. These soils are strongly acid.

The Orlando soils occur with the Blanton, Lakeland, Eustis, Scranton, and Leon soils. The Lakeland and Eustis soils are better drained than the Orlando and have a thinner, lighter colored surface layer; the Blanton soils have a lighter colored surface layer; the Scranton soils have poorer drainage; and the Leon soils have somewhat poor drainage, a thinner, lighter colored surface layer, and an organic pan.

Orlando fine sand, level phase (0 to 2 percent slopes) (Ob).—This soil occupies small- to medium-sized areas in the central and west-central parts of the county. Nearly all of it is level, but about 100 acres is in small depressions or occurs at the foot of slopes. Here, dark-colored sandy materials have washed or sloughed onto areas of this soil from the adjacent sloping Lakeland, Eustis, and Blanton soils. Water moves rapidly downward through the soil. In a few of the depressions the soil remains flooded for a few hours after intensive rains. Cold air accumulates on some of the level areas and in depressions and damages winter crops. The native vegetation consists of bluejack and live oaks, pine, and a few shrubs and grasses.

Profile description:

0 to 12 inches, very dark gray (10YR 3/1), nearly loose fine sand.
12 to 22 inches, dark grayish-brown (10YR 4/2), nearly loose fine sand.
22 to 40 inches, grayish-brown (10YR 5/2), loose fine sand.
40 to 48 inches +, light-gray (10YR 7/2), loose fine sand with a few, fine, distinct mottles of strong brown (7.5YR 5/6).

The surface layer ranges from black to dark gray in color. It is lighter colored in areas that adjoin Lakeland and Blanton soils than elsewhere. The dark-colored surface horizon is commonly 9 to 18 inches thick, but in spots within a few of the depressions it is about 24 inches thick. The deeper horizons range from light gray or pale brown to yellowish brown in color.

The soil is moderately high in organic matter and nitrogen, but it is low in other plant nutrients. It is rapidly permeable to air and water and has a deep rooting zone for plants. The water-holding capacity is moderate.

Use and management.—Approximately 67 percent of this soil is in citrus groves, 22 percent is in forest, 7 percent is in native pasture, and 4 percent is in improved pasture. Vegetables are grown on a few acres. Under good management, citrus trees produce high yields on this soil. Improved pastures furnish good-quality forage for cattle. Pines and hardwoods, which grow rapidly, supply lumber, poles, and other wood products. The areas also provide shelter and food for wildlife.

Wooded areas that have adequate air drainage could be cleared and planted to citrus trees. Other areas could be used for improved pasture and for suitable crops. The soil responds well if fertilizer is added, lime is applied when needed, and other good management practices are used. During dry seasons, crops need irrigation.

A cover crop or a natural growth of weeds worked into the soil helps to replenish or increase the supply of organic matter. The vegetation also retards wind erosion in cultivated areas. Hairy indigo, crotalaria, cowpeas, velvetbeans, and beggarweed are suitable for cover crops. Pensacola bahiagrass, common bahiagrass, pangolagrass, and hairy indigo are suitable for improved pastures. (Capability unit IIIse–2.)

Orlando fine sand, very gently sloping phase (2 to 5 percent slopes) (Oc).—The profile of this soil is essentially the same as that of Orlando fine sand, level phase. The surface layer is generally dark colored and ranges from 9 to 18 inches in thickness. Where the soil lies next to Blanton and Lakeland soils, however, the surface layer is lighter colored than elsewhere. In several narrow areas, the soil has slopes of 5 to 8 percent.

This soil is porous. Most of the rainfall is absorbed readily, and water moves rapidly downward through the profile. Erosion is negligible. This soil is easy to till and responds well to fertilization and to other good management practices.

Approximately 59 percent of this soil is in citrus groves, 20 percent is in forest, and 8 percent is in cultivated crops. An additional 8 percent is in improved pasture, and 5 percent is in native pasture. Lumber, poles, and other wood products are obtained from the forests. The areas provide food and shelter for wildlife.

This soil is used and managed in about the same way as the level phase. Hairy indigo, crotalaria, Hubam clover, cowpeas, velvetbeans, and beggarweed or a natural growth of other weeds should be used as a cover in groves and cultivated fields. The cover crop reduces the risk of serious erosion during intense rains and tends to replenish or increase the supply of organic matter. The organic matter helps the soil absorb and retain more water. If the weather is favorable and good management is practiced, high yields of citrus fruits, suitable cultivated crops, and improved pastures can be obtained. The management should include irrigation and the use of fertilizer and lime. (Capability unit IIIse–2.)

Pamlico Series

The soils of the Pamlico series have formed from well-decomposed remains of aquatic and other plants mixed with a small amount of sand. These soils occur throughout the county in depressions or in shallow, wet areas. They are very poorly drained and are often covered with a few inches of water during several months of the year. These soils are strongly acid to very strongly acid. Many of the areas have a cover of sedges, pickerelweed, lilies, arrowhead, and grasses. Other areas have a cover of bay, gum, cypress, and other trees and shrubs.

The Pamlico soils occur with the Brighton, Rutlege, Plummer, Leon, Immokalee, and St. Johns soils. Compared with the Pamlico soils, the Brighton soils are less decomposed and have little or no sand mixed with the organic materials; the Rutlege and Plummer soils consist almost entirely of mineral materials and have little organic matter, except in the upper few inches of the profile; and the Leon, Immokalee, and St. Johns soils are mineral soils and have better drainage.

Only one soil of this series, Pamlico muck, has been mapped in Orange County.

Pamlico muck (Pa).—Nearly all of this soil is in the flatwoods in the eastern and southern parts of the county. A few areas in the western part occur as shallow, intermittent ponds.

In most places the organic matter, or muck, is 12 to 36 inches thick. In many areas, however, it is as much as 60 inches thick, and in a few spots it is about 96 inches thick. In general, the layer of organic matter is thinnest in the outer part of an individual area and thickest at the center. The organic materials are mixed with various amounts of sand. Commonly, the shallow deposits contain more sand than the thicker ones.

Profile description:

0 to 18 inches, black (10YR 2/1) muck, or well-decomposed organic matter, mixed with a small amount of sand grains.
18 to 30 inches, black (10YR 2/1), mucky fine sand.
30 to 40 inches, dark-gray (10YR 4/1), loose fine sand.
40 to 48 inches +, gray (10YR 5/1), loose fine sand that is transitional, with increasing depth, to light-gray (10YR 7/2) fine sand.

The thickness of the organic materials varies over short distances within an area and from one area to another. In areas where the layer of muck is shallow, the underlying mineral materials soon become light in color.

The soil is high in nitrogen but is deficient in potassium, phosphorus, and other essential plant nutrients. It is rapidly permeable to air and moisture and has a deep rooting zone for plants. The organic materials absorb a great deal of water but shrink considerably upon drying.

Use and management.—Nearly 50 percent of this soil is covered by wet forests, 46 percent is in marshes or native pastures, and 4 percent is in improved pastures. Only a small acreage is used for cultivated crops. The improved pastures and cultivated fields have been drained to some extent. If this soil is fertilized, limed, and otherwise well managed, high yields of cultivated crops and improved pastures can be obtained. The marsh vegetation furnishes fair grazing for cattle when the areas are not covered too deeply with water. The forests produce timber and other wood products for sale. Many areas serve as reservoirs for water. Most areas provide shelter and food for wildlife.

Adequate control of the water table is essential if this soil is to be reclaimed for more intensive agricultural use. Most of the soil lies next to poorly drained or somewhat poorly drained soils, all of which would benefit from a good drainage system. If the soil is properly drained and well managed, vegetables and other cultivated crops and improved pastures will produce high yields. Pangolagrass, common bahiagrass, Pensacola bahiagrass, bermudagrass, caribgrass, paragrass, white clover, and Hubam clover are suitable for improved pasture.

The soil is easy to cultivate with heavy machinery. However, it packs, oxidizes, and shrinks. This restricts drainage between the field ditches. During dry periods the organic materials on freshly plowed fields may be blown about by strong winds. To retard oxidation and subsidence of the organic materials, the water table should be kept as near the surface as crop requirements permit. Cover crops grown in the cultivated fields will replenish or increase the supply of organic matter. (Capability unit IIIws–4.)

Plummer Series

The soils of the Plummer series have formed from moderately thick deposits of sand. They are on wet flats or in depressions in the flatwoods and also occupy very gently sloping areas that receive seepage from higher lying soils. In the flats or depressions, there is little or no surface runoff. The water table is very shallow. When the water table is not too near the surface, internal drainage is rapid. During part of the year, these soils may be covered with a few inches of water.

These soils have a thin, gray to very dark gray surface layer and light-gray or white deeper horizons. They are strongly acid to very strongly acid.

In most of the areas, there are no trees and only a sparse to moderate stand of short vegetation, chiefly St. Johnswort, broomsedge, rushes, sedges, pitcherplants, and wiregrass. There are a few clumps of saw-palmettos and myrtle bushes, and, in some areas, scattered pines or a growth of cypress.

The Plummer soils occur with the Rutlege, Leon, Immokalee, Ona, and Blanton soils. The Rutlege soils have a darker, thicker surface layer than the Plummer soils; the Leon, Immokalee, and Ona soils are better drained and have an organic pan or a brown, organic-stained horizon; the Blanton soils are much better drained; and the Pompano soils are slightly acid to alkaline.

Only one soil of the Plummer series, Plummer fine sand, has been mapped in Orange County.

Plummer fine sand (0 to 2 percent slopes) (Pb).—This soil is mainly on flats or in slight depressions in the eastern, southern, and northwestern parts of the county. In the western part of the county, narrow areas border many of the lakes or surround areas of very poorly drained soils. In a few places near lakes and streams, this soil has slopes of 2 to 5 percent.

Profile description:

0 to 4 inches, dark-gray (10YR 4/1), nearly loose fine sand.
4 to 12 inches, light brownish-gray (10YR 6/2), loose fine sand.
12 to 42 inches +, light-gray (10YR 7/1), loose fine sand.

The surface layer ranges from gray or grayish brown to very dark gray in color and from 4 to 8 inches in thickness. The changes in colors are gradual from one horizon to another. In many places the light-gray or white horizon lies immediately beneath the surface layer. In some places a brown or dark-brown sandy horizon begins at depths of 30 to 42 inches. In a small acreage, mottled light-gray, pale-yellow, and yellowish-brown fine sandy clay loam begins at depths of 30 to 42 inches.

This soil is low in organic matter and in essential plant nutrients. It is poorly drained. It has a very low moisture-holding capacity. When the water table is not near the surface, water moves rapidly downward through the sandy horizons. The soil is permeable to air and water and has a deep rooting zone for plants. Nevertheless, because the water table is usually near the surface, the soil generally is poorly aerated and plant roots are restricted to the upper part of the profile.

Use and management.—Approximately 82 percent of this soil is in native pasture, 10 percent is in improved pasture, 7 percent is in forest, and a small acreage is used for cultivated crops. The native vegetation provides fair grazing. A small amount of cypress timber is harvested from the ponds, and poles and lumber are cut from pine trees. The cultivated fields and improved pastures have been drained to some extent. The areas furnish shelter and food for wildlife.

This soil is naturally low in organic matter and plant nutrients. It is too wet for most crops to grow well. If the soil is drained adequately, fertilized, limed, protected by a cover crop, and otherwise well managed, improved pastures, vegetables, and other suitable crops will produce high yields. Sesbania, crotalaria, hairy indigo, velvetbeans, or some other leguminous cover crop that is worked into the soil will help replenish or increase the supply of organic matter. The organic matter helps the soil retain more moisture and plant nutrients.

A cropping system consisting of grasses and vegetable crops could be used in some areas. Pangolagrass, common bahiagrass, Pensacola bahiagrass, bermudagrass, caribgrass, paragrass, white clover, and hairy indigo are suitable for improved pastures. During extremely dry seasons, cultivated crops and improved pastures need irrigation. (Capability unit IVws–1.)

Pomello Series

The soils of the Pomello series have formed in thick deposits of sand. They are on low, nearly level ridges. They have a thin, gray or light-gray surface layer underlain by nearly white sand that extends to a depth of 30 or more inches. An organic pan occurs between 30 and 60 inches of the surface.

These soils are strongly acid. They are somewhat poorly drained to moderately well drained. Little or no water is lost through runoff. The level of the water table fluctuates from shallow to deep. Water moves rapidly downward through the profile when the water table is not too near the surface.

The native vegetation consists of pine, runner oak, dwarf live oak, saw-palmetto, pricklypear cactus, gallberry, and wiregrass.

The Pomello soils occur with the Leon, Ona, Blanton, Lakeland, and St. Lucie soils. They differ from the Leon and Ona soils in having a lighter colored surface layer and an organic pan that occurs at a greater depth. Unlike the Pomello soils, the St. Lucie soils have a much deeper water table, and the Blanton and Lakeland soils are yellower beneath the surface horizon.

In Orange County only one soil of the Pomello series, Pomello fine sand, has been mapped.

Pomello fine sand (0 to 5 percent slopes) (Pc).—Most of this soil is on low ridges in the flatwoods in the eastern, southern, and northwestern parts of the county. The areas are medium to large in size. Most of this soil is surrounded by Leon soils or occurs between the Leon soils and the better drained Lakeland and Blanton soils. Small areas lie between the Lakeland and Blanton soils and either poorly drained soils or the lakes in the western part of the county.

This soil is at slightly higher elevations and is better drained than the Leon soils. Most of it is nearly level. Several areas have slopes of 2 to 5 percent, and a few spots, near sinkholes, lakes, and streams, have steeper slopes.

Profile description:

0 to 3 inches, gray (10YR 5/1), loose fine sand.
3 to 10 inches, light-gray (10YR 7/1), loose fine sand.
10 to 40 inches, white (10YR 8/1), loose fine sand.
40 to 48 inches +, very dark grayish-brown (10YR 3/2), weakly cemented organic pan of fine sand.

The surface soil normally ranges from light gray to gray in color and from 2 to 6 inches in thickness. In some places it is dark gray and is only about 2 inches thick. In places the layer of white, loose fine sand begins immediately below the surface layer. In general, the organic pan occurs at depths between 30 and 60 inches. The pan varies greatly in color and in compactness. In places it is only a thin, brown-stained horizon; in other places it is nearly black and is hard when dry. Generally, it is cemented with organic matter.

This soil is low in organic matter and is deficient in most of the essential plant nutrients. It is sandy and porous; as a result, water is absorbed readily and moves downward rapidly. The capacity for retaining moisture and plant nutrients is low. The soil is too droughty for crops.

Use and management.—Approximately 44 percent of this soil is in native pasture, 39 percent is in forests or cutover areas, and 13 percent is in improved pasture. Only about 3 percent is used for citrus groves, and 1 percent is used for cultivated crops. The native pastures provide poor to fair grazing for cattle. Some of the forests have fair to good stands of pine. Others contain dwarf live oak and low shrubs. The areas provide shelter and a little food for wildlife.

This soil is not good for cultivated crops or citrus trees. It is used to a small extent for citrus trees, mainly where the areas are needed to fill out rectangular groves that are predominantly on better soils. Even under intensive management, this soil is droughty and too low in plant

nutrients for the cultivated crops common to this area. Moderately good yields are obtained on improved pasture under intensive management. Bahiagrass and other deep-rooting, drought-resistant grasses grow moderately well if heavily fertilized and if the areas are not overgrazed. (Capability unit Vsw–1.)

Pompano Series

The soils of the Pompano series have formed in moderately thick deposits of sand that overlie alkaline materials. They are on wet flats or in depressions in the flatwood areas near the eastern boundary of the county. At times the soil is covered with a few inches of water for several weeks. The level of the water table fluctuates from very shallow to moderately deep. Surface runoff is slow. Except when the water table is near the surface, water moves rapidly downward through the soil. The upper horizons of the profile are medium acid to neutral, and the lower horizons are nearly neutral to alkaline.

The vegetation includes St. Johnswort, cabbage palmetto, a few clumps of saw-palmetto, cypress, pine, and various kinds of grasses, sedges, and rushes. Some areas have a thick stand of cabbage palmetto, water oak, live oak, gum, and other hardwoods.

Typically, the profiles of these soils consist of sandy materials to a depth of 42 or more inches. Where fine sandy loam or fine sandy clay loam begins at depths of 30 to 42 inches, a shallow phase has been mapped.

The Pompano soils occur with the Felda, Charlotte, Delray, Manatee, Adamsville, Leon, and Immokalee soils. The associated soils differ from the Pompano soils in the following ways: The Felda soils have clayey materials within 30 inches of the surface; the Charlotte soils have brighter colored material—yellow, brownish yellow, or yellowish brown—beginning at depths of 12 to 24 inches; the Delray and Manatee soils have darker, thicker surface layers; the Adamsville soils are better drained; the Leon and Immokalee soils are better drained and contain organic pans; and the Plummer soils have a strongly acid to very strongly acid subsoil.

Pompano fine sand (0 to 2 percent slopes) (Pd).—This soil occurs on broad, wet flats that are northeast, east, and southeast of Christmas. A few areas lie next to the Everglades mucky peats in the northwestern part of the county. Most of the areas are covered with a few inches of water after intense rains, and they may remain saturated for many weeks. Some areas receive surface runoff from slightly higher areas of Adamsville and Leon soils. Only a few shallow ditches have been dug to remove excess surface water. During the dry spring months, the water table may recede to depths of 30 to 50 inches.

Profile description:

0 to 4 inches, very dark gray (10YR 3/1), nearly loose fine sand.
4 to 12 inches, gray (10YR 5/1), loose fine sand.
12 to 20 inches, light brownish-gray (10YR 6/2), loose fine sand.
20 to 42 inches +, pale-brown (10YR 6/3), loose fine sand.

The surface layer ranges from grayish brown to very dark gray in color and from 3 to 8 inches in thickness. In places the layers between 12 and 42 inches have fine, distinct streaks of brownish yellow (10YR 6/6) and yellow (2.5Y 7/6). In some places the profile just described is underlain by gray (10YR 5/1) and yellowish-brown (10YR 5/6) fine sandy clay loam or by fragments of limestone. Near areas of Leon and Immokalee soils, the profile may have a brown or dark-brown, stained horizon at depths of 30 to 42 inches. Small spots of Charlotte fine sand, which has brownish-yellow or yellowish-brown lower horizons, occur in some areas.

This soil is low in organic matter and is deficient in most of the essential plant nutrients. The sandy profile is rapidly permeable to air and water and has a deep rooting zone for plants.

Use and management.—Approximately 73 percent of this soil is in forest, 23 percent is in native pasture, and 4 percent is in improved pasture. Cultivated crops are grown on only a few acres. Forests consisting mainly of cabbage palmetto, pine, oak, gum, and maple, but containing some cypress, supply a moderate amount of lumber and other wood products.

Native pastures of short grasses, sedges, rushes, and scattered cabbage palmettos and pines furnish fair grazing for cattle. The pastures generally are burned over late in winter, and the new vegetation that comes up is grazed readily. Improved pastures and cultivated fields are drained, to some extent, by shallow ditches. If this soil is managed properly, medium to high yields of cultivated crops and pastures are obtained. The areas furnish food and shelter for wildlife.

Adequate drainage is needed in areas to be used intensively for agriculture. Inasmuch as this soil occupies large areas adjacent to areas of other poorly drained to somewhat poorly drained soils, many thousands of acres could be drained and used for crops and improved pastures. A water-control system, with properly designed ditches and dikes and simple control structures, is suitable for both drainage and subirrigation. If such a system is installed and if other good management is practiced, vegetables and other truck crops, suitable field crops, and improved pastures should produce high yields. For high yields, fertilizer and lime must be added.

Sesbania, hairy indigo, Hubam clover, velvetbeans, or a natural stand of weeds can be used as a cover crop in cultivated fields. The cover crop, when turned under, increases the supply of organic matter and enables the soil to retain more moisture and plant nutrients.

A cropping system consisting of grasses and cultivated crops can be used. After a field has been cultivated, a good grass sod is established and kept on the field for 2 or more years. Then, the field is again used for a cultivated crop. Pangolagrass, common bahiagrass, Pensacola bahiagrass, Coastal bermudagrass, caribgrass, paragrass, hairy indigo, Hubam clover, and white clover are suitable for improved pastures in areas that have been drained. (Capability unit IVws–2.)

Pompano fine sand, shallow phase (0 to 2 percent slopes) (Pe).—This soil occurs on flats or in slight depressions southeast of Christmas. It is adjacent to the other Pompano soils. The profile is similar to that of Pompano fine sand, except that fine-textured materials begin at depths of 30 to 42 inches. These consist of grayish-brown to light-gray fine sandy clay loam or fine sandy clay that have common, fine to medium, distinct mottles of yellow and yellowish brown. This soil is

slightly sticky when moist and hard when dry. In places the clayey materials are interbedded with coarser textured materials.

About 89 percent of this soil is in forest, 9 percent is in native pasture, and 2 percent is in improved pasture. This soil is similar to Pompano fine sand in use and management, and yields are about the same. (Capability unit IVws-2.)

Pompano fine sand, overflow phase (0 to 2 percent slopes) (Pf).—This soil is on the outer part of the flood plain of the St. Johns River. It is only a few inches higher than most of the flood plain. The soil is similar to Pompano fine sand, shallow phase. It contains clayey materials that normally begin at depths of 30 to 42 inches. In some areas near the river, however, the fine-textured materials occur within 30 inches of the surface, but in areas near the slightly higher Adamsville soils, they begin at depths below 42 inches.

The native vegetation consists chiefly of short grasses, sedges, and rushes, which contrast greatly with the thick stand of cabbage palmetto and the scattered oaks on the adjacent Adamsville soils. On a small acreage there are oaks, gums, maples, and a few cabbage palmettos.

This soil is covered by native vegetation that furnishes fair to good grazing for cattle during many months of the year. The areas also provide food and shelter for wildlife. If the floodwaters and the level of the water table are controlled, this soil can be used more intensively for agriculture. If it is managed properly, high yields of improved pasture and of suitable crops can be obtained. (Capability unit IVws-2.)

Rutlege Series

The soils of the Rutlege series have formed in moderately thick deposits of acid sands. They are poorly drained to very poorly drained. The level areas may be covered with several inches of water during many months of the year. In most areas surface runoff is very slow, but in seepage areas on the slopes it is medium. The level of the water table fluctuates from shallow to deep. When the water table is not near the surface, water moves rapidly downward through the soil. The soils are strongly acid to very strongly acid.

Many areas are covered with short grasses, sedges, ferns, gallberry bushes, fetterbushes, pickerelweed, myrtle bushes, and aquatic plants. In addition to these plants, some areas have pine trees and other areas have a stand of bay, cypress, gum, and maple.

The Rutlege soils occur with the Plummer, St. Johns, Immokalee, Leon, Ona, and Scranton soils. The Plummer soils have a surface layer that is thinner and lighter colored than that of the Rutlege soils. The St. Johns, Immokalee, and Leon soils are better drained and have organic pans. The Scranton and Ona soils are better drained, and the Delray soils are slightly acid or alkaline instead of strongly acid to very strongly acid.

Rutlege fine sand (0 to 2 percent slopes) (Ra).—This nearly level, poorly drained to very poorly drained soil occurs in the flatwoods, mostly in the eastern, southern, and northwestern parts of the county. The areas are small to medium in size. They are adjacent to areas of organic soils and swamps or to areas of low, wet soils. These soils also occupy sites that are surrounded by better drained soils. Small, narrow areas lie adjacent to lakes and ponds in the western part of the county.

Many of the areas receive drainage water from higher soils but lack natural outlets for water. Other areas serve as poorly defined drainageways in the flatwoods. In the western and northwestern parts of the county, several areas with slopes of 2 to 8 percent receive seepage from areas of higher lying soils.

This soil is sandy to a depth of 42 inches. Finer textured materials occur in places at depths of 42 to 72 or more inches.

Profile description:

0 to 12 inches, black (10YR 2/1), nearly loose sand that contains a large amount of organic matter.
12 to 20 inches, very dark gray (10YR 3/1), nearly loose fine sand.
20 to 36 inches, gray (10YR 5/1), loose fine sand.
36 to 48 inches +, light-gray (10YR 7/1), loose fine sand with a few, distinct streaks of yellow and brown.

The surface layer ranges from black to dark gray in color. In places the black to very dark gray materials are 9 to 24 inches thick. In areas where the surface layer is about 9 inches thick, the underlying horizon is dark gray. In the deeper layers, there is an abrupt transition to lighter colors. In some areas the surface layer is dark gray and is 12 to 18 inches thick. In places a brown, dark-brown, or dark grayish-brown horizon occurs at depths of about 30 to 42 inches.

The soil contains a large amount of organic matter and nitrogen, but it is deficient in other essential plant nutrients. The water table is very shallow. The sandy, porous profile is very permeable to roots, air, and moisture when the water table is not too near the surface.

Use and management.—Approximately 52 percent of this soil is in wet, forested areas, 43 percent is in native pasture and marshes, and 4 percent is in improved pasture. Only about 1 percent is used for cultivated crops. Most of the forests consist of a mixed stand of cypress, bay, gum, and maple, but some areas also have a few pine trees. A moderate amount of timber and other wood products is harvested for sale.

The marsh vegetation and native pastures provide fair to good grazing for cattle when the areas are not covered too deeply with water. The improved pastures and cultivated fields are drained, to some extent, by shallow ditches. Under good management, improved pastures and suitable crops produce good yields. This soil also provides food and shelter for wildlife.

The undrained areas of this soil are suitable only for native pasture, for trees that grow in wet areas, and, to a limited extent, for water storage. If the soil were drained adequately, irrigated, fertilized and limed when needed, and otherwise managed intensively, high yields of improved pasture and suitable crops could be obtained on additional areas.

A cropping system consisting of grasses and cultivated crops can be used. A cultivated crop is grown for 1 or 2 years and is followed by 2 to 5 years of improved grasses before another cultivated crop is planted. Pangolagrass, Pensacola bahiagrass, common bahiagrass, bermudagrass, caribgrass, paragrass, white clover, and Hubam clover are suitable for seeding the pastures. Cover crops worked into the soil in cultivated fields will maintain or increase the supply of organic matter. (Capability unit IIIws-1.)

Rutlege fine sand, shallow phase (0 to 2 percent slopes) (Rb).—This soil is on flats or in slight depressions. Unlike Rutlege fine sand, it contains clayey materials that begin at depths of 30 to 42 inches. The clayey materials consist of gray or light-gray sandy clay loam or fine sandy clay that has common, fine to medium, distinct mottles of yellowish brown, pale yellow, and light olive brown. In a few acres the surface layer is made up of a large amount of mucky organic materials. In other characteristics the soil resembles Rutlege fine sand.

Approximately 40 percent of this soil is in wet, forested areas, 19 percent is in native pasture or marshes, and 19 percent is in improved pasture. Approximately 22 percent is used for cultivated crops. Most of the forests have a stand of cypress, bay, gum, and maple, but a few of them also have pine trees. Some timber and other wood products are harvested. Sedges, rushes, pickerelweed, aquatic plants, many short grasses, and a few trees grow in the marshes and on the native pastures. They provide fair to good forage for cattle if the areas are not covered deeply with water. The areas also serve as habitats for wildlife. Cultivated fields and improved pastures are drained, to some extent, by shallow ditches. If this soil is managed properly, cultivated crops and improved pastures produce medium to high yields.

In use and management this soil is similar to Rutlege fine sand. Yields are about the same. (Capability unit IIIws–1.)

Rutlege mucky fine sand (0 to 2 percent slopes) (Rc).—This soil is in depressions in the eastern and southern parts of the county. It differs from Rutlege fine sand in that it has much decomposed organic matter in the surface layer. This organic material, which is mixed with variable amounts of sand, is 4 to 12 inches thick. It is underlain by black or very dark gray fine sand that is transitional, with increasing depth, to gray and light-gray fine sand containing a few streaks of yellow and brown. In places a dark-brown or very dark gray horizon, which resembles an organic pan, is at depths of 36 to 42 inches. The sandy materials extend to depths of 42 to 54 or more inches.

This soil is in the lowest parts of saucerlike basins in which drainage is very poor. Water covers the soil during many months of the year. A denser stand of vegetation grows on this soil than on Rutlege fine sand. Most areas have a growth of bay, gum, cypress, and maple and an understory of pickerelweed, sedges, water lilies, a few grasses, and other aquatic plants. In addition, pine trees grow in many areas. In some of the areas there are only a few trees.

Nearly 88 percent of this soil is in wet, forested areas, 11 percent is in native pasture and marshes, and 1 percent is in improved pasture. Only a small acreage is used for cultivated crops. A moderate amount of timber is harvested from the forests. The native pastures and marshes provide fair grazing for cattle if they are not covered too deeply with water. With a high level of management, including adequate control of the water, cultivated crops and improved pastures will produce high yields. Undrained areas serve as reservoirs for water. Most of the areas provide food and shelter for wildlife.

This soil is in low, wet areas, most of which have a dense stand of trees and shrubs. Consequently, clearing and draining additional areas so they can be used more intensively would be expensive. (Capability unit IIIws–1.)

St. Johns Series

The soils of the St. Johns series have formed in moderately thick deposits of acid sands and under the influence of somewhat poor to poor drainage. The level of the water table fluctuates between shallow and deep. Runoff is slow in the nearly level areas. Internal drainage is medium to rapid when the water table is not near the surface.

These soils are strongly acid to very strongly acid. They have a thick, black or very dark gray surface layer underlain by a light-gray, leached horizon. A nearly black organic pan commonly begins at depths of 14 to 30 inches.

The St. Johns soils occur with the Leon, Immokalee, Ona, Scranton, Rutlege, and Plummer soils. The associated soils differ from the St. Johns soils in the following ways: The Leon and Immokalee soils have lighter colored, thinner surface horizons; the Ona soils have a brown, organic-stained horizon immediately beneath the surface horizon; the Scranton soils lack an organic pan; and the Rutlege and Plummer soils are more poorly drained and generally lack organic pans.

In Orange County only one soil of the St. Johns series, St. Johns fine sand, is mapped.

St. Johns fine sand (0 to 2 percent slopes) (Sa).—This soil occupies areas that are small to medium in size. It is mainly in the eastern and southern parts of the county. A few areas are near lakes or very poorly drained soils in the north-central and western parts of the county. Most of the areas are at the same elevation, or slightly lower, than areas of the adjacent Leon soils. In many places this soil occurs between the Leon soils and the poorly drained or very poorly drained Rutlege soils.

The vegetation consists of pine, saw-palmetto, gallberry bushes, myrtle bushes, fetterbush, huckleberry, broomsedge, and wiregrass.

Profile description:

0 to 9 inches, black (10YR 2/1), nearly loose fine sand that is high in organic matter.
9 to 13 inches, gray (10YR 5/1), loose fine sand.
13 to 23 inches, light-gray (10YR 7/1), loose fine sand.
23 to 29 inches, black (10YR 2/1) fine sand that is cemented by organic matter.
29 to 34 inches, very dark grayish-brown (10YR 3/2) fine sand.
34 to 42 inches +, brown (10YR 4/3), loose fine sand that is transitional, at a depth of 60 inches, to light yellowish-brown or pale-brown fine sand.

The surface layer ranges from black to very dark gray in color and from 8 to 15 inches in thickness. In places the texture of the surface layer is mucky fine sand. Two or more successive organic pans occur in places where the profile contains several feet of sandy materials. In a few places there is a layer of gray or light-gray fine sandy clay loam at depths of 30 to 42 inches. Included with this soil are small areas in which the soil lacks a leached layer and has an organic pan immediately beneath the surface.

This soil contains a large amount of organic matter and nitrogen, but it is deficient in many of the essential plant nutrients. The water table is at shallow depths.

Water, air, and roots penetrate the soil easily when the water table is low. The dark-colored horizons are moderate to high in moisture-holding capacity.

Use and management.—Nearly 78 percent of this soil is in forest, 20 percent is in native pasture, and 2 percent is in improved pasture. Cultivated crops are grown on only a few acres. Pine trees make fair to good growth on this soil. Short grasses, sedges, and shrubs furnish fair to good forage for cattle. If this soil is managed properly, high yields of improved pastures and cultivated crops are obtained. The areas provide food and shelter for wildlife.

Adequate water control is important if this soil is to be used more intensively for agriculture. If the soil were drained adequately, fertilized and limed when needed, irrigated during dry seasons, and otherwise well managed, high yields of vegetables, field crops, and improved pastures could be obtained on additional areas. (Capability unit IIIsw–1.)

St. Lucie Series

The soils of the St. Lucie series are commonly referred to as "scrub" because they support a natural growth of scrub live oak, sand pine, rosemary, runner oak, saw-palmetto, pricklypear cactus, and wiregrass. These soils are excessively drained and contain little moisture, even in the rainy season. They are strongly acid to very strongly acid.

The surface layer consists of very thin, light-gray or gray sandy materials. It is underlain by light-gray or white, sandy horizons that extend to a depth of 60 or more inches.

The St. Lucie soils occur with the Blanton, Lakeland, Pomello, and Leon soils. The associated soils differ from the St. Lucie soils in the following ways: The Blanton and Lakeland soils have yellow materials in the deeper horizons; the Pomello soils occupy slightly lower, more slowly drained areas, retain more moisture, and contain an organic pan, which is generally at depths of 30 to 60 inches; the Leon soils have a darker surface horizon, are more slowly drained, and contain an organic pan that begins at depths of 14 to 30 inches.

Only one member of the St. Lucie series, St. Lucie fine sand, has been mapped in Orange County.

St. Lucie fine sand (0 to 5 percent slopes) (Sb).—This soil occurs mainly on low ridges or on slight knolls in the flatwoods. These areas are small to medium in size. A few other areas lie adjacent to the Lakeland and Blanton soils in the west-central and northwestern parts of the county. The soil is mainly nearly level to very gently sloping, but several small areas near sinkholes and lakes have slopes of 5 to 12 percent. The soil is porous, and nearly all of the rainfall enters and percolates through the profile.

Profile description:

0 to 2 inches, gray (10YR 5/1), loose fine sand mixed with a small amount of organic matter and grains of sand.
2 to 6 inches, light-gray (10YR 7/1), loose fine sand.
6 to 42 inches +, white (10YR 8/1), loose fine sand.

The very thin surface layer ranges from gray to light gray in color. In places, the light-colored sands are underlain, at depths of 60 to 96 or more inches, by a dark brown or very dark brown organic pan. In the western part of the county, a few areas of Lakewood fine sand (not mapped separately in this county) are included with this soil. The Lakewood soil is distinguished by yellow, brownish-yellow, or reddish-yellow fine sand that begins at depths of 10 to 20 inches.

The St. Lucie soil is low in organic matter and is extremely low in essential plant nutrients. It is very permeable to air and water. Roots can penetrate easily to great depths. The soil is droughty and has very low water-holding capacity. It is inherently poor for farming. Strong winds may cause erosion in areas that have a sparse covering of vegetation.

Use and management.—About 90 percent of this soil is in forests of scrub trees and shrubs, 2 percent is in native pasture, 2 percent is in improved pasture, 4 percent is in citrus groves, and 2 percent is used for cultivated crops. The quality of the forage in the pastures and of timber and other wood products is poor. Even under a high level of management, poor yields of citrus fruits, cultivated crops, and improved pastures are obtained. The areas provide food and shelter for wildlife. (Capability unit VIIs–1.)

Scranton Series

The soils of the Scranton series have formed from moderately thick deposits of sands and loamy sands and under the influence of somewhat poor to poor drainage. Runoff is slow in the nearly level areas. The level of the water table fluctuates between shallow and deep. Water moves rapidly downward through the soil when the water table is not near the surface.

The vegetation consists of pine, a few oaks, and an undergrowth of myrtle bushes, gallberry, runner oak, a few clumps of saw-palmettos, and wiregrass and other grasses.

These soils have a thick, dark-colored surface layer and light-gray, pale-brown, or pale-yellow deeper horizons.

The Scranton soils occur with the Ona, Blanton, Leon, Immokalee, St. Johns, Plummer, and Rutlege soils. The Scranton soils lack the brown, organic-stained horizon immediately beneath the surface layer that is typical of the Ona soils; they have a darker, thicker surface layer than the Blanton soils; they lack the organic pan of the Leon, Immokalee, and St. Johns soils; and they are better drained than the Plummer and Rutlege soils but not so well drained as the Orlando soils.

Scranton fine sand is the only member of the Scranton series mapped in Orange County.

Scranton fine sand (0 to 2 percent slopes) (Sc).—This soil occurs in areas that are small to medium in size. It is mainly in the central, eastern, and southern parts of the county, but some areas are in the western and northwestern parts. Some of this soil occupies positions similar to those occupied by the Leon soils. Other areas are between the Leon soils and the better drained Blanton soils.

In general, this soil is nearly level. A few areas have short slopes of 2 to 5 percent, and on a small acreage the slopes are between 5 and 8 percent. The soil is porous, and nearly all of the rainfall is absorbed and percolates through the profile. Some cultivated fields

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are drained artificially to lower the water table after excessive rainfall.

Profile description:

0 to 9 inches, black (10YR 2/1), nearly loose fine sand that contains a large amount of organic matter.
9 to 12 inches, very dark gray (10YR 3/1), loose fine sand.
12 to 18 inches, gray (10YR 5/1), loose fine sand.
18 to 30 inches, light brownish-gray (10YR 6/2), loose fine sand.
30 to 42 inches +, light-gray (10YR 7/2), loose fine sand with common, fine to medium, distinct mottles of pale yellow, yellow, and yellowish brown.

The surface layer ranges from black to dark gray in color and from 9 to 15 inches in thickness. In several cultivated areas the surface layer is dark gray and is 12 to 20 inches thick. The deeper horizons are light gray, light brownish gray, pale brown, or pale yellow. In a few places mottled gray, pale-yellow, and yellowish-brown fine sandy clay loam begins at depths of 42 to 48 inches.

This soil is medium in natural fertility. It is moderately high in organic matter and nitrogen but is low in other essential plant nutrients. The soil is strongly acid to very strongly acid. It is rapidly permeable to air and water. Roots of many plants penetrate the soil deeply. If rainfall is normal, there is enough moisture for many different kinds of crops. Supplemental irrigation is needed during the extremely dry spring.

Use and management.—Approximately 38 percent of this soil is in citrus groves, 22 percent is in forest, 21 percent is in native pasture, and 10 percent is in improved pasture. About 9 percent is used for cultivated crops. Under good management high yields of citrus fruits, vegetables, and suitable field crops are obtained on this soil. Pine trees grow rapidly. The natural growth of grasses, sedges, and shrubs furnishes fair grazing for cattle. Improved pastures that are fertilized, limed, and well managed otherwise provide about four or five times as much forage as native pastures.

Inasmuch as this soil is suited to many cultivated crops and to improved pastures, many additional areas could be cleared and used more intensively. Pangolagrass, Pensacola bahiagrass, common bahiagrass, bermudagrass, white clover, Hubam clover, and hairy indigo are suitable for seeding improved pastures.

Hairy indigo, sesbania, crotalaria, velvetbeans, cowpeas, beggarweed, or a natural growth of weeds should be used as a cover crop in cultivated fields, as well as in citrus groves. The cover crop protects against wind erosion, and, when it is turned under, it helps to maintain or increase the supply of organic matter.

If good management is practiced, this soil is well suited to citrus crops. In most areas drainage is adequate, but in some places shallow ditches are needed to remove excessive surface water after heavy rains. The citrus groves need to be irrigated, fertilized and limed, and protected against diseases and insects. (Capability unit IIsw–1.)

Management of Soils

This section has three main parts. In the first, general management practices that apply to all of the soils are discussed. In the second, the system of capability classification is described; the soils are placed in different capability classes, subclasses, and units; and the use suitability and management requirements of each capability unit are discussed. In the third, estimates of yields for suitable crops are given for each of the soils under two levels of management.

General Management Practices

The primary purpose of a soil survey report is to help the farmer and other landowners plan the proper use and treatment of different kinds of soils. In this part of the report, the main practices used in managing the soils of Orange County are discussed.

Fertilizing and Liming.—Most of the soils of Orange County are naturally low in plant nutrients and are acid. The essential plant nutrients can be obtained by adding fertilizer, and the acidity can be corrected by adding lime. Most farmers apply enough fertilizer and lime to obtain fair to good yields of cultivated crops, citrus crops, and improved pastures. In 1954, about 79,078 tons of commercial fertilizer was used on 81,738 acres of fruit trees and vegetable crops and on 10,837 acres of hay and cropland pastures, 15,624 acres of other pastures, 483 acres of corn, and 1,383 acres of other crops. A total of 28,803 tons of lime was applied to 36,780 acres used for various crops.

Tests to indicate the reaction of the soil and the content of essential plant nutrients help determine the need for lime and fertilizer. The kinds and amounts of amendments needed for different crops vary, however, and for this reason no specific suggestions for fertilizing and liming the soils are given in this report.

Maintaining Organic Matter.—The soils of the county, especially the mineral soils, need a continuous good supply of organic matter. The organic matter helps the soils retain moisture and plant nutrients.

In the mineral soils, the content of organic matter generally ranges from less than 1 to as much as 5 percent, although the mucky fine sands contain as much as 40 percent. The mucks and mucky peats consist mainly of organic materials that overlie layers of mineral soil.

Crop residues and cover crops or crops used as green manure are important sources of organic matter. Hairy indigo, velvetbeans, Hubam clover, crotalaria, sesbania, various grasses, or a volunteer growth of weeds should be used to cover the cultivated areas when crops are not being grown. Some of these cover crops can be used in the citrus groves. When the cover crop is worked into the soil, it not only adds organic matter but also protects the fields and groves from erosion.

Drainage and Irrigation.—Adequate drainage and irrigation are both necessary if crops are to grow successfully on the soils of Orange County. In much of the western and northwestern parts of the county there are well-drained to somewhat excessively drained soils. In the nearly level areas in the eastern and southern parts are mainly somewhat poorly drained to poorly drained soils; these soils have a water table that fluctuates from very shallow to deep. Most pasture plants and many other crops grow satisfactorily on the somewhat poorly drained soils, but artificial drainage is necessary for high-quality pastures. If the poorly drained soils were drained adequately and fertilized when needed, they could be used more intensively for agriculture.

A drainage system consisting of open ditches with control structures to regulate the removal of excess surface water is needed in areas to be used for cultivated crops and improved pastures (fig. 6). If the system of shallow ditches is designed properly, it can be used to subirrigate cultivated crops and improved pastures. Sandy soils to be planted to citrus trees require adequate drainage to depths of 36 to 48 inches. Supplemental irrigation water can be applied to many crops by using a sprinkler system. If the proper amount of moisture is maintained in the soil, many kinds of crops can be grown.

Figure 6.—**Shallow ditch with a control structure to remove excess water during wet periods and to supply water through subirrigation during dry periods.**

It is difficult to maintain the water table at a uniform level. Consequently, it is best to make sure the soil is drained adequately and then apply irrigation water as needed. In cleared areas of organic soils, the water table should be kept as near the surface as practical so as to retard the oxidation and subsidence of organic materials.

Cropping Systems.—No definite crop rotations are followed on the soils of Orange County. A cropping system consisting of grasses and vegetables or one of grasses and field crops is suitable on many of the soils. After vegetables or field crops are grown, the field is kept in improved pasture for several years before being planted again to cultivated crops.

Vegetables and other truck crops are commonly grown in a short cropping system in which one crop is followed by another during a single season. In some fields, the same crop may be grown several times during one season. In the summer a cover crop is planted or a volunteer growth of weeds is allowed to cover the field.

Tillage.—Fields and citrus groves need to be tilled on the contour. This will retard erosion during periods of intensive rainfall. Commonly, the soil is disked with a tandem disk harrow that is drawn by a tractor. Some of the organic soils are turned by diskplows, and the seedbeds are prepared by harrowing and leveling. A cover crop or a natural stand of weeds is incorporated into the soil by using a disk harrow.

Capability Groups of Soils[2]

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs and limitations of the soils, on the risks of damage to them, and also on their response to management. There are three levels above the soil mapping unit in this grouping. They are the capability unit, subclass, and class.

The capability unit, which can also be called a management group, is the lowest level of soil capability grouping. A capability unit is made up of soils similar in the kind of management they need, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kinds of limitations. The letter "e" indicates that risk of erosion is an important limiting factor; "w" means there is risk to crops or of soil damage by excess water; and "s" shows that the soils are droughty, shallow, or have some other unfavorable internal characteristic. For most of the soils of Orange County, there are at least two kinds of limitation that have almost equal dominance. For these, a double subclass designation is used. Most excessively drained, sloping, sandy soils are droughty and are also subject to erosion; many soils with poor soil qualities also have seasonal problems of excess water; and many naturally wet soils have serious soil limitations if adequately drained. The first letter of the double subclass designation gives the dominant limitation.

The broadest grouping, the land capability class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All the land classes, except class I, may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils (none in Orange County) are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care. There are no class I soils in Orange County.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use. These need even more careful management.

In class IV are soils that have greater natural limitations than those in class III, but they can be cultivated for some crops under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops

[2] This section by James R. Moore, soils specialist, Soil Conservation Service.

but that can be used for pasture or range, for woodland, or for wildlife.

Class V soils are nearly level and gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep, droughty, or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils provide only poor to fair yields of forage or forest products and have characteristics that limit them severely for these uses.

In class VIII (none in Orange County) are soils that have practically no agricultural use. Some of them have value as parts of watersheds, as wildlife habitats, or for recreation.

Capability classification of the soils of Orange County

The soils of Orange County have been grouped into classes, subclasses, and units as follows:

Class II.—Soils that have some limitations that reduce the choice of plants or soils that require some conservation practices.

Subclass IIsw: Somewhat poorly drained soils for which the choice of crops is slightly restricted because of the very sandy texture. Seasonal wetness also requires corrective practices.

Unit:

IIsw–1: Nearly level, deep, sandy soils that are moderately wet during rainy seasons.

Class III.—Soils that have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Subclass IIIws: Poorly drained and very poorly drained soils that require drainage before they can be used for cultivated crops. These soils have low capacity for holding available moisture, are low in fertility, or deteriorate rapidly when drained; they require soil-improvement practices.

Unit:

IIIws–1: Nearly level, deep, wet, strongly acid soils that have thick, dark surface layers.

IIIws–2: Nearly level, deep, wet, slightly acid to neutral soils that have dark surface layers.

IIIws–3: Nearly level, wet, neutral soils underlain by clayey materials at depths of less than 30 inches.

IIIws–4: Very wet peats and mucks.

Subclass IIIsw: Moderately well drained to somewhat poorly drained soils on which the choice of crops is severely limited by low capacity for holding available moisture, shallowness, or low fertility. Seasonal wetness also requires corrective practices.

Unit:

IIIsw–1: Moderately wet, very sandy soils with dark-colored surface layers underlain at depths of less than 30 inches by a pan layer stained with organic matter.

Subclass IIIse: Soils limited mainly by low capacity for holding available moisture and by low fertility. They are subject to erosion.

Unit:

IIIse–1: Nearly level to very gently sloping (0 to 5 percent slopes), deep, droughty, sandy soils.

IIIse–2: Nearly level to very gently sloping (0 to 5 percent slopes), deep, sandy soils that have a favorable water table.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, or that require very careful management, or both.

Subclass IVws: Poorly drained and very poorly drained soils that require drainage before they can be used for cultivated crops. These soils have very low capacity for holding available moisture and very low fertility.

Unit:

IVws–1: Nearly level, deep, wet, strongly acid soils that are light colored and sandy.

IVws–2: Nearly level, deep, wet, slightly acid to neutral soils that are light colored and sandy.

Subclass IVsw: Somewhat poorly drained soils on which the choice of crops is very severely limited by low capacity for holding available moisture, shallowness, or low fertility. Seasonal wetness also requires corrective practices.

Unit:

IVsw–1: Nearly level, strongly acid, moderately wet, sandy soils underlain at depths of less than 42 inches by a pan layer stained with organic matter.

IVsw–2: Nearly level, slightly acid or neutral, moderately wet soils that consist of fine sand to depths of more than 30 inches.

Subclass IVse: Soils very severely limited for use as cropland, mainly by lack of capacity for holding available moisture or by low fertility. They are subject to erosion.

Unit:

IVse–1: Gently sloping (5 to 8 percent slopes), deep, droughty, sandy soils.

Subclass Vws: Wet soils that can be used for pasture or woods.

Unit:

Vws–1: Nearly level, wet, black, clayey soils subject to overflow.

Vws–2: Nearly level, neutral, moderately wet, sandy soils, shallow to marl.

Subclass Vsw: Soils that can be used for pasture or woods but that are limited by low fertility or by low capacity for holding available moisture.

Unit:

Vsw–1: Nearly level, strongly acid, deep, nearly white soils that have ground water fluctuating within root zones.

Class VI.—Soils that have severe limitations that make them generally unsuited to cultivation and that limit their use largely to permanent cover.

Subclass VIse: Sloping soils subject to erosion.

Unit:

VIse–1: Sloping, deep, droughty, sandy soils subject to moderately severe erosion.

Class VII.—Soils unsuitable for cultivation because of very severe limitations.

Subclass VIIs: Soils that have very low fertility and capacity for holding available moisture.

Unit:

VIIs–1: Nearly level to rolling, deep, dry, sandy soils of very low fertility.

Management of capability units

The use suitabilities and management requirements of the 18 capability units in Orange County are discussed in the following pages.

CAPABILITY UNIT IIsw–1

In this capability unit are nearly level, deep, strongly acid, moderately wet mineral soils that are high in organic matter. The soils have slopes of less than 2 percent. They occur in fairly small areas, most of which are scattered widely throughout the eastern, central, and southern parts of the county.

The surface layers consist of very dark gray or black fine sand, and the subsurface layers, of gray to grayish-brown, porous fine sand. Below this and continuing to depths of more than 30 inches is gray, very pale brown, or pale-yellow, porous fine sand. Some of the profiles have a layer of fine sand, stained brown or dark brown, just below the surface soil.

Surface runoff is slow, but the soils are very permeable, and water moves rapidly through the profile. In wet seasons the water table rises to within 10 inches of the surface. In dry seasons it may recede to depths below 60 inches.

The following soils are in capability unit IIsw–1:

Ona fine sand (0 to 2 percent slopes).
Scranton fine sand (0 to 2 percent slopes).

These soils are productive and are easily managed. They are not subject to erosion. The principal limiting factors are low moisture-holding capacity, rapid leaching, and periodic wetness, which is caused by the high water table. Simple drainage for removing excess surface water during wet seasons and the regular use of green-manure cover crops are the only special practices needed to keep cultivated areas productive.

If managed properly, these soils are well suited to citrus trees. About 25 percent of the acreage is used for that purpose. These soils need deeper drainage for citrus fruits than for other crops. Water-control systems that are designed properly are essential in the citrus groves. Such systems require deep ditches or tile with structures to control the water and provide adequate internal drainage during wet seasons. Also needed are shallow ditches and soil bedding; these permit excess rainfall to drain rapidly from the surface. Sesbania, beggarweed, or other cover crops should be grown regularly to maintain the content of organic matter in the surface soil.

These soils are excellent for truck crops, although only about 6 percent of the acreage is used for that purpose. They need a simple system of shallow ditches to remove excess surface water. The ditches, if designed and constructed properly, provide subirrigation during dry seasons. Tile, placed at a shallow depth and designed for both drainage and irrigation, can be used instead of ditches. Other good management for truck crops includes the use of large amounts of fertilizer and lime and the growing of sesbania, hairy indigo, beggarweed, various grasses, or other cover crops to help maintain the content of organic matter. Rotating truck crops with improved pasture gives good results.

These soils are excellent for improved pasture. Pangolagrass and Coastal bermudagrass, either grown alone or mixed with whiteclover or other legumes, are suitable for seeding. Large amounts of lime and a fertilizer that includes minor elements are necessary for high yields. Pastures should be rotated to permit the periodic recovery of the grass.

A little more than half of the total acreage is still in native pasture or woodlands. Much of this is suitable for the planting or natural reseeding of slash pine; protection from fire and excessive grazing is necessary. Good native pastures can be developed by checking the growth of palmettos and other shrubs.

CAPABILITY UNIT IIIws–1

The soils of this capability unit are nearly level, deep, and wet and are strongly acid. They occur in all parts of the county but principally along drainageways or in small depressions in the flatwoods. The soils have formed from acid sands.

The surface layers, which are high in organic matter, consist of very dark gray or black fine sand. This is underlain by dark-gray, gray, or light-gray fine sand, which extends to depths of more than 30 inches. In some places a clay subsoil begins just below a depth of 30 inches. In others, the fine sand extends to indefinite depths.

The water table is naturally high in these soils. Normally, it is near the surface, but water covers the surface during wet seasons. The soils are porous, and water moves rapidly through the profile. The native vegetation is either of a marsh type, consisting of water-tolerant grasses, sedges, and ferns, or of a swamp-forest type, consisting of cypress or bay, gum, and maple and a heavy undergrowth of vines and shrubs.

The following soils are in capability unit IIIws–1:

Rutlege fine sand (0 to 2 percent slopes).
Rutlege fine sand, shallow phase (0 to 2 percent slopes).
Rutlege mucky fine sand (0 to 2 percent slopes).

The capability of these soils is limited principally by wetness. Erosion is not a problem. If the soils are drained and are well managed otherwise, they are suitable for many uses. They are usually difficult to drain, however, and require moderately intensive management of water.

Only a small acreage of these soils has been improved so that they can be used for agriculture. About half of the acreage is still covered by swamp vegetation. Most of the rest is made up of undeveloped native pastures or marshlands, and less than 5 percent is in improved pastures or under cultivation.

Several factors have kept the soils from being improved. Much of the acreage is in small, scattered, saucerlike depressions within areas of less favorable soils that are used extensively for native pasture. Most of these individual depressions are so small that reclaiming the soils would not be feasible. Furthermore, it would be very difficult to remove the swamp vegetation

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in some areas. Therefore, at the present time it would not be feasible to reclaim these soils. The initial cost would be too high.

The small areas that have been drained are well suited to many kinds of cultivated crops if the water is controlled properly. The system used to control water needs to be designed carefully because each area has particular problems. The size of each area, its position in relation to adjacent soils, and the accessibility of drainage outlets must be considered. Shallow ditches that are spaced properly will remove the excess surface water quickly. These should connect with deeper ditches that have control structures and adequate outlets. The water-control system should be designed so as to provide subirrigation during dry seasons.

The soils are high in organic matter and nitrogen but are deficient in most of the plant nutrients. They require large amounts of a fertilizer that contains minor elements. For maintaining the content of organic matter, crops should be grown either in a sequence that includes beggarweed, sesbania, hairy indigo, or some other legume grown as a cover crop. Otherwise, a cropping system that consists largely of improved pasture should be used.

These soils are not well suited to citrus crops. Citrus trees have been grown successfully on a few isolated areas, but the unfavorable characteristics of the soils and the danger of severe damage through frost and excess water limit their use for this purpose.

Improved pastures on these soils produce good-quality forage consisting of grass and clover. Shallow ditches that are well spaced and that have good outlets will remove the excess surface water in the pastures. Large amounts of lime and fertilizer are needed. Yields of forage can be increased if grazing is controlled to the extent that plants on grazed areas will recover.

These soils are well suited to cypress and other wetland hardwoods. The trees grow slowly, however, and they are not important economically. Pines grow well in areas that have been drained. They can be encouraged to replace the hardwoods if drainage is improved, fires are controlled, and selective harvesting is practiced. The forests provide refuges for deer, wild turkeys, raccoons, and other kinds of wildlife.

Areas of native grasses provide good grazing if well managed. Yields are good, particularly in dry seasons, but simple surface drainage would improve the yields.

CAPABILITY UNIT IIIws-2

In this capability unit are nearly level, deep, wet soils that are slightly acid to neutral. Most of the areas are in the eastern part of the county. They consist of hardwood swamps or of wet, grassy savannas.

The surface layers are very dark gray to black fine sand. Below this is gray to light-gray fine sand that extends to depths of more than 30 inches. The sand is underlain by marl; by fine-textured alkaline materials that are at depths between 30 and 42 inches; or by alkaline fine sand that extends to indefinite depths. The soil is flooded frequently, but it is open and porous. Therefore, water from precipitation and irrigation water move rapidly through the profile.

The soils of this capability unit are similar to the soils of capability unit IIIws–1. They differ in that they are underlain by calcareous materials and are less acid.

The following soils are in capability unit IIIws–2:

Delray fine sand (0 to 2 percent slopes).
Delray fine sand, shallow phase (0 to 2 percent slopes).
Delray mucky fine sand (0 to 2 percent slopes).

Excessive wetness is a recurring risk and is the principal limitation of these soils. The requirements for controlling water are similar to those for the soils of capability unit IIIws–1, but the yields of cultivated crops and improved pastures are slightly higher. These soils require less lime than the soils of unit IIIws–1, but they require about the same kinds and amounts of fertilizer. They are particularly well suited to clover.

Less than 3 percent of the acreage has been cultivated, and a slightly larger acreage is in improved pasture. Most of the acreage consists of native pastures or of swamps in which there are stands of cypress and other hardwoods. These areas provide food and shelter for wildlife. These soils lie next to areas of other soils that are used for native pastures, and reclaiming them is a problem. Therefore, they have not been developed to their highest capability.

The areas of native grasses provide fair grazing, especially when the soils are not excessively wet. The cypress trees and slow-growing hardwoods are of limited importance economically.

Like the soils of capability unit IIIws–1, these soils are well suited to cultivated crops if they are managed properly. A system of controlling water must be maintained to remove the excess surface water in wet seasons and to supply irrigation water during dry seasons. Cover crops grown in a sequence with clean-tilled crops, or a cropping system in which clean-tilled crops are grown for 1 year between several years of improved pasture, will maintain the content of organic matter.

CAPABILITY UNIT IIIws-3

In this capability unit are wet, poorly drained and very poorly drained, nearly level soils. The soils are in nearly level areas or in slight depressions, principally in the eastern part of the county.

The surface layers are grayish-brown or black and range from fine sand to fine sandy loam in texture; those made up of finer textured materials are high in organic matter. The surface layers are porous enough to permit water and air to move rapidly through the profile. The subsoils of fine sandy clay loam to fine sandy clay are neutral to alkaline and are slow to moderate in permeability. In general, marl is 30 to 60 inches below the surface.

These soils are similar to the soils of capability unit IIIws–2. They differ principally in having fine-textured materials within 30 inches of the surface and, in most areas, a finer textured surface layer. Furthermore, their surface layers are neutral to slightly acid and contain more organic matter.

The following soils are in capability unit IIIws–3:

Felda fine sand (0 to 2 percent slopes).
Manatee fine sandy loam (0 to 2 percent slopes).

Wetness is the dominant limitation of these soils. The soils are not subject to erosion. They can be improved and used for crops and pastures. In areas that have

been reclaimed for agriculture, the continuing risk of wetness makes it necessary to use moderately intensive practices to control water.

If drained and irrigated properly, these soils are excellent for many kinds of crops. Water-control systems similar to those described for the soils of capability unit IIIws–1 are required.

The capacity for holding available moisture is greater in these soils than in the soils of capability unit IIIws–2, and they respond better to fertilizer. The content of organic matter can be maintained by growing soil-building cover crops in a sequence with cultivated crops or by using a cropping system in which improved pastures alternate with cultivated crops.

After simple surface drainage is installed, good-quality improved pastures can be established. The soils are well suited to clover. Improved pastures, consisting of grasses grown alone or mixed with clover, yield well if they are fertilized and grazing is rotated between two or more areas.

About 90 percent of the total acreage in this capability unit is in forest, and slightly less than 10 percent is marshlands. Little of the land has been reclaimed. The marshlands provide fair grazing during dry seasons, but usually they are too wet for grazing during wet seasons. The forests consist of poor-quality wetland hardwoods and cabbage palmettos that are of little economic value. The soils are generally in small depressions within areas of less desirable soils that are used for native pasture. The areas are too small to improve separately. Forested areas provide shelter for cattle and food and shelter for wildlife. Wildlife habitats can be improved through the planting of suitable food plants.

CAPABILITY UNIT IIIws–4

In this capability unit are deep, nearly level peats and mucks that are very wet and strongly acid to neutral. These dark-brown to black organic soils have formed from the remains of aquatic plants that have collected in shallow ponds and in wet depressions.

Under natural conditions these soils consist of dark reddish-brown, soft, felty peat that ranges from 12 to more than 120 inches in thickness. The peat is underlain by different kinds of materials ranging from acid sand to marl. After these soils are drained for agricultural use, a surface layer forms; it consists of very dark brown to black muck or mucky peat. This surface layer is generally 10 to 20 inches thick.

The following soils are in capability unit IIIws–4:

Brighton mucky peat, shallow phase.
Brighton mucky peat, moderately deep phase.
Brighton mucky peat, deep phase.
Brighton mucky peat, very deep phase.
Everglades mucky peat, shallow phase.
Everglades mucky peat, moderately deep phase.
Everglades mucky peat, deep phase.
Everglades mucky peat, very deep phase.
Pamlico muck.

Excess water is the initial limitation of these soils. The soils must be reclaimed before they can be used for cultivated crops and pasture. After they have been reclaimed, the principal limitation is the constant risk of subsidence by oxidation throughout the solum. The soils are not suitable for citrus crops or forests.

If they are drained properly, these soils are excellent for cultivated crops. Large areas, particularly near Zellwood, are used extensively for truck crops and for growing bulbs. Adequate drainage can be established through a system of canals, lateral drainage ditches, and mole drains. Control structures are installed in the main canals to keep the water table at a proper level.

During the cropping season the water table needs to be lowered enough to permit roots to grow well. At other times it should be raised to prevent oxidation. Sesbania, aeschynomene, beggarweed, and other cover crops, grown in a regular sequence with cultivated crops, will restore some of the organic matter lost through oxidation. Although these soils are high in nitrogen, they are low in other plant nutrients and need frequent, large applications of a fertilizer that contains minor elements. The acid soils require large amounts of lime.

Improved pastures are important on these soils. If well managed, pastures of tame grasses or of grasses and clover produce excellent forage. Excess surface water must be drained off, and the water table must be kept within a few inches of the surface. Deep drainage makes the soils oxidize rapidly. Large amounts of fertilizer are needed. Pastures should be grazed in rotation to permit the periodic recovery of grasses.

Small, isolated areas of these soils occur in many parts of the county. The areas are narrow and marshy. They surround lakes or occur as "muck ponds" within larger areas of less desirable soils that are used as native pasture. The native aquatic plants provide little forage for cattle, but the areas serve as feeding and nesting grounds for many kinds of waterfowl. The areas can be developed further for wildlife through the planting of desirable food plants.

CAPABILITY UNIT IIIsw–1

In this capability unit are level, strongly acid to very strongly acid, moderately wet, very sandy soils that have an organic pan within 30 inches of the surface. The soils are mainly in small areas in the flatwoods in the eastern part of the county. They have dark-gray to black surface layers that are moderately high in organic matter. Between the surface layer and the organic pan is light-gray or almost white, highly leached fine sand. In many areas there are clayey materials within 42 inches of the surface.

Because the level of the water table fluctuates, these soils remain moderately wet during many months of the year. They are generally very porous throughout, and water moves freely through the profile. In areas that have a clayey subsoil, however, the movement of water is restricted slightly. The water-holding capacity of the surface soil is fair.

The following soils are in capability unit IIIsw–1:

Leon fine sand, level heavy substratum phase (0 to 2 percent slopes).
Leon fine sand, very gently sloping heavy substratum phase (2 to 5 percent slopes).
St. Johns fine sand (0 to 2 percent slopes).

These soils are limited by several factors. During most of the year, wetness is limiting, but this can be corrected through simple surface drainage. Other unfavorable characteristics result in greater limitations. Although the surface soil normally contains enough or-

ganic matter to maintain a good supply of moisture for short periods, the leached layer immediately beneath it is poor for the development of roots. The organic pan further limits the use suitability.

The soils are not well suited to general farm crops and are used but little for that purpose. If managed intensively, they are moderately well suited to truck crops and other specialized crops.

A water-control system that is designed and installed properly will keep the water table at a suitable level. Such a system consists of lateral ditches that are spaced properly; of controlled outlets into larger canals; and of outlet canals with control structures. In wet seasons such a system provides adequate drainage, and in dry seasons it is used for subirrigation. Large amounts of lime and of a fertilizer that contains minor elements are needed. Cover crops should be grown frequently to maintain or increase the supply of organic matter. Rotating crops with improved pasture improves the tilth of the soils.

Good improved pasture of tame grasses or of a mixture of grasses and clover can be grown if simple management practices are used. Shallow drainage ditches are needed in the pastures. For best yields, a water-control system that provides surface drainage and subirrigation is desirable. Lime and fertilizer should be applied liberally. Rotated grazing will permit a healthy recovery of plants in grazed areas.

Most of the acreage is occupied by forests or native pasture. Slash pine grows fairly rapidly. Forests can be improved by installing simple surface drains, and by controlling grazing, protecting the trees from fire, and harvesting them selectively. If desirable native vegetation is encouraged, native pastures do moderately well. If they are overgrazed, burned too often, or otherwise managed improperly, the more desirable forage plants become sparse or are crowded out by palmettos and other undesirable plants.

These soils are not very well suited to citrus crops. Where local conditions are favorable and the soils are managed intensively, however, small groves have been successful.

CAPABILITY UNIT IIIse–1

This capability unit is made up of nearly level or very gently sloping, deep, droughty, sandy soils through which water moves rapidly. These soils are on the more gentle slopes of the ridges in the western part of the county. The slopes are as much as 5 percent.

The surface layers of these soils are gray to grayish-brown fine sand. They are underlain by gray or pale-brown to yellowish-red fine sand that extends to depths of more than 42 inches. The water table is deep. The soils are porous and droughty, and their capacity for holding moisture is low. They are strongly acid.

The following soils are in capability unit IIIse–1:

Blanton fine sand, level high phase (0 to 2 percent slopes).
Blanton fine sand, very gently sloping high phase (2 to 5 percent slopes).
Eustis fine sand, level phase (0 to 2 percent slopes).
Eustis fine sand, very gently sloping phase (2 to 5 percent slopes).
Lakeland fine sand, level phase (0 to 2 percent slopes).
Lakeland fine sand, very gently sloping phase (2 to 5 percent slopes).

These soils are limited for agricultural use, mainly because of their sandy texture. In addition, they are low in organic matter and are highly leached. Erosion is a minor problem, but strong winds or heavy rains may damage unprotected areas.

These soils are well suited to citrus crops and are used mainly for those crops in Orange County. Good management includes the growing of cover crops between the trees, cultivating on the contour, applying lime and fertilizer, and irrigating. In groves that do not make too much shade, hairy indigo, crotalaria, Hubam clover, and other cover crops provide a good protection from erosion. A grass sod or a dense growth of weeds also furnishes good cover. Tilling on the contour, particularly in the more sloping areas, helps to reduce the amount of runoff and protects against erosion. Properly designed sprinkler irrigation systems are needed during extended droughts.

These soils are not well suited to general farm crops or to truck crops grown commercially. If irrigated and fertilized heavily, they are suited to small home gardens and to the growing of ornamentals. Organic residues and legume cover crops need to be worked into the soil.

The soils are moderately well suited to improved pastures. Pangolagrass, bahiagrass, and other deep-rooted grasses do well. Although hairy indigo and other drought-resistant legumes can be grown successfully, it is difficult to establish and maintain good pastures of grasses and clovers. A high level of management is needed to obtain good yields. Frequent fertilizing and liming are necessary. Controlled grazing helps to prevent the grasses from becoming stunted.

A good harvest of longleaf pine was once produced on these soils, but forestry is not important now. Most areas that have scattered stands of pine and scrub oak could be used profitably for citrus groves or for urban development. Nevertheless, open areas can be planted to slash pine (fig. 7). The trees need protection from fire and from grazing. They should be harvested selectively.

Figure 7.—**A 3-year-old stand of slash pine growing in a depression on a Lakeland fine sand. This area has poor air drainage and is too cold for citrus trees.**

CAPABILITY UNIT IIIse–2

In this capability unit are nearly level to very gently sloping, rapidly permeable, deep, sandy soils in which the water table is favorable for plants. These soils occur mainly in the northeastern part of the county with other sandy soils that are more poorly drained.

The surface layers consist of gray to very dark gray fine sand. They are underlain by faintly mottled, lighter gray fine sand that extends to depths well below 30 inches.

These soils are acid and are low in all of the essential plant nutrients. They are very porous, and water moves rapidly through the profile. Most of the areas are low enough so that the level of the water table fluctuates within the lower part of the root zone. The areas are high enough, however, so that the root zone normally is well aerated. As a result, the soils are not so droughty as those of capability unit IIIse–1.

The following soils are in capability unit IIIse–2:

Blanton fine sand, level shallow low phase (0 to 2 percent slopes).
Blanton fine sand, level low phase (0 to 2 percent slopes).
Blanton fine sand, very gently sloping low phase (2 to 5 percent slopes).
Orlando fine sand, level phase (0 to 2 percent slopes).
Orlando fine sand, very gently sloping phase (2 to 5 percent slopes).

The principal limitation of these soils is their sandy texture. Plant nutrients leach out rapidly, and it is difficult to retain an adequate supply of moisture. In most of the areas, erosion and the control of water are not serious problems. Nevertheless, the water table may be high in low-lying areas during wet seasons, and drainage may be needed to prevent damage to some crops.

These soils are well suited to citrus crops, and much of the acreage is used for that purpose. In most respects the groves are managed like those on soils of capability unit IIIse–1, although the soils of capability unit IIIse–2 have a more favorable water table. The roots of the citrus trees on the soils of capability unit IIIse–2 extend into the moist area just above the water table; consequently, the trees are not affected so seriously by drought as trees on the soils of unit IIIse–1. During wet seasons, however, the water table rises high enough to damage the root systems, particularly in low-lying areas. Excess water can be removed through shallow ditches, by bedding, or by other means.

Because of the favorable height of the water table, these soils are a little better suited to improved pastures than the soils of capability unit IIIse–1. They are suited to the same pasture plants as soils of capability unit IIIse–1, and the pastures need about the same management.

These soils are only moderately well suited to cultivated crops; they are not cultivated extensively. Nevertheless, if well managed, they are well suited to home gardens and ornamentals. Organic matter must be returned to the soils in the form of crop residues and cover crops. Irrigation is needed during dry seasons, and the soils require large amounts of fertilizer. More than half of the acreage is undeveloped rangeland and forest. Pine trees grow well. Slash pine grows rapidly and produces good stands if protected from fire and grazing

Figure 8.—Stand of slash pine on Blanton fine sand, level low phase. This soil is especially productive of slash pine because the tree roots are within reach of the water table.

(fig. 8). The stands can be improved by planting seedlings and by encouraging natural reseeding.

Some of the native pastures have a low carrying capacity. If they are managed properly, the carrying capacity should be moderate. Many native forage grasses and plants grow well if they are not overgrazed or crowded out by undesirable plants.

CAPABILITY UNIT IVws–1

In this capability unit are nearly level, deep, wet, gray soils that are sandy and strongly acid. These soils generally occur with the soils of capability unit IVsw–1 in the flatwoods in the southern and eastern parts of the county. They are usually very wet and are covered with a few inches of water during most of the year.

The surface layers consist of gray to dark-gray fine sand. This grades to light-gray or light brownish-gray fine sand that generally extends to depths below 42 inches. The soils are low in organic matter and are very low in natural fertility. They are very porous, and water moves through them rapidly. When drained, they have a very low moisture-holding capacity. In this county, only one soil, Plummer fine sand (0 to 2 percent slopes), is in capability unit IVws–1.

This soil is limited by extreme wetness. The areas must be drained before they can be improved, but drainage requirements are fairly simple. Other important limitations, however, are related to the sandy texture, low natural fertility, and low moisture-holding capacity. The soil is constantly being leached of plant nutrients, so it is difficult to improve the fertility by applying fertilizer. Erosion is not a problem.

Only a small part of this soil is under cultivation. Cultivated areas are suited only to truck crops and ornamentals, which require a very high level of management. For these crops the soil is managed in about the same way as the soils of capability unit IVsw–1 and IVsw–2, but it needs more intensive practices to control water.

This soil is suitable for improved pastures. Good yields of suitable grasses and legumes are obtained under

a high level of management. If it is to be used for pasture, the soil should be drained and managed like the soils of capability unit IVsw–1. Because the areas are lower and wetter than those in capability unit IVsw–1, the water-control system must be designed more carefully.

Most of this soil is in unimproved pasture. The wetland-prairie type of vegetation provides fair grazing if the range is managed properly.

A small acreage is covered by forests. Small cypress trees grow in a few areas, and there are scattered stands of pine on the better drained areas. Undrained areas are too wet for pines to grow well. If simple surface drainage is installed, however, fair to good stands of pine are obtained.

Areas that have not been reclaimed provide important feeding and nesting areas for many kinds of waterfowl. Although individual areas can be reclaimed for more intensive agricultural use, much of this soil is best kept in its natural state or improved as a habitat for wildlife.

CAPABILITY UNIT IVws–2

In this capability unit are nearly level, deep, wet, gray soils that are sandy and strongly acid to neutral. These soils occur in depressions and along broad, flat drainageways or swamps in the eastern part of the county.

The surface layers are thin and consist of fine sand that is low in organic matter. This grades to lighter colored, porous fine sand. In most areas the fine sand extends to depths of more than 42 inches, but in a few areas clayey material is at depths of 30 to 42 inches.

The water table is at or near the surface during most of the year. During wet seasons several inches of water often covers the surface. Areas along the major streams are flooded occasionally.

The following soils are in capability unit IVws–2:

Charlotte fine sand (0 to 2 percent slopes).
Pompano fine sand (0 to 2 percent slopes).
Pompano fine sand, shallow phase (0 to 2 percent slopes).
Pompano fine sand, overflow phase (0 to 2 percent slopes).

Excessive wetness is a constant risk that limits the use of these soils. Where good outlets are available, however, the soils can be drained easily by using simple surface drains. They are much more severely limited for agriculture, however, by the low moisture-holding capacity, low natural fertility, and deep sandy texture. Erosion is not a problem.

Only a small part of these soils is cultivated. Truck crops and special crops are grown under intensive management. The water-control system needs to be designed and operated carefully. Cover crops must be grown frequently and worked into the soil to replenish the supply of organic matter. Large amounts of fertilizer are needed.

Good to excellent improved pastures can be obtained on these soils if a grass-clover mixture is seeded and a system of water control is installed. The water-control system is used for drainage during wet seasons and for subirrigation during dry seasons. Dikes are needed in areas that are flooded occasionally. Large amounts of fertilizer are required, and grazing must be controlled. In general, these soils are not suited to citrus trees.

Almost three-fourths of the total acreage is still in wetland forests of limited value. Only a small acreage has been reclaimed for more intensive agricultural use. The initial cost of reclaiming these soils has restricted their development. Native areas provide important habitats for many kinds of wildlife. The areas can be protected and improved as part of the wildlife conservation program.

About one-fourth of the acreage consists of unimproved wetland prairies that are used as open range for cattle. Under proper management, native grasses and forage plants grow moderately well. If the areas are burned too frequently or grazed too heavily, the more desirable plants decrease.

CAPABILITY UNIT IVsw–1

This capability unit is made up of nearly level, moderately wet, sandy soils that have an organic pan within 42 inches of the surface. They are the dominant soils in the flatwoods in the southern and eastern parts of the county.

The surface layers consist of gray to dark-gray fine sand that grades to light-gray or nearly white fine sand. They are underlain by an organic pan, 3 to 6 inches thick. In most places unconsolidated fine sand, several feet thick, underlies the pan.

Because of the high water table, these soils are wet during much of the year. Nevertheless, in dry seasons when the level of the water table recedes, they become droughty. The soils are very porous; water moves rapidly through the profile. Most of the soluble minerals have leached out, and the soils are low in fertility and are strongly acid to very strongly acid. Fertilizer and lime also leach out rapidly.

The following soils are in capability unit IVsw–1:

Immokalee fine sand (0 to 2 percent slopes).
Leon fine sand (0 to 2 percent slopes).

Several factors limit the capability of these soils; their use for cultivated crops is severely restricted. Seasonal wetness is a limitation that can be controlled adequately. More severe limitations are the low supply of plant nutrients, unfavorable texture, high acidity, poor moisture-holding capacity, and the organic pan. Erosion is not a problem. Truck crops and other specialized crops can be grown on these soils under a high level of management.

The level of the water table can be regulated by water-control systems that are designed carefully. These systems consist of lateral ditches, or tile, with control structures and well-constructed outlets. They provide subirrigation during dry seasons. The soils are open and porous, so they are well suited to this type of water-control system. Cover crops, grown after the cultivated crops are harvested, should be worked into the soil to replenish the supply of organic matter. Fertilizer and lime can be applied according to the needs of specific crops.

These soils are well suited to good-quality improved pastures (fig. 9). Most areas being reclaimed are used for this purpose. If simple practices are used to improve drainage and if large amounts of fertilizer and lime are applied, excellent pastures of tame grasses can be established. If the water-control system is suitable for

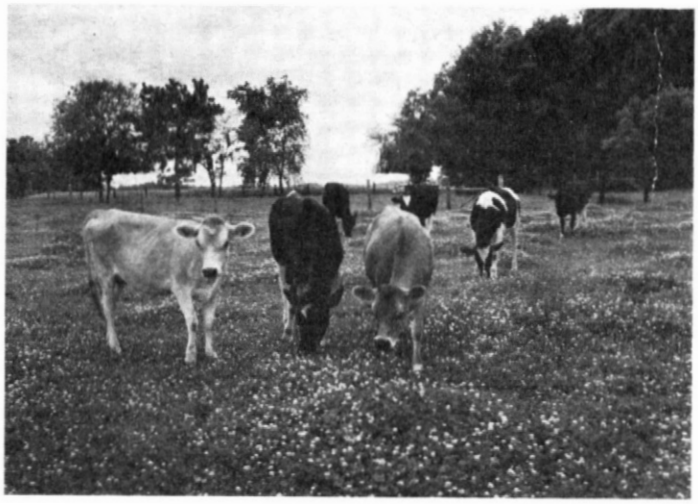

Figure 9.—Cattle grazing on an improved pasture of whiteclover on Leon fine sand.

subirrigation, good-quality pastures consisting of grass-clover mixtures also can be established. For good yields on pastures, grazing should be controlled so that the plants on grazed areas will have a chance to recover.

Large areas of these soils are in native pastures consisting of many kinds of grasses and other forage plants. If well managed, the pastures are of good quality. Yields of forage can be increased by chopping the palmettos and by burning the areas carefully. Grazing should be controlled so that the desirable forage plants will increase.

Originally, these soils were covered by pine forests. Much of the acreage is now under a second growth of pine. Under good management pine trees normally make moderate to good growth. The forests can be improved by planting seedlings and by encouraging natural reseeding. Young trees need protection from fire and grazing.

CAPABILITY UNIT IVsw-2

In this capability unit are level, slightly acid to neutral, moderately wet, sandy soils in which more than 30 inches of fine sand overlies calcareous clay or marl. These soils are at slightly higher elevations than the wetlands in the eastern part of the county. They have surface layers of gray to very dark gray fine sand that grades to subsurface layers of gray to very pale brown. In some places the fine sand extends to depths of more than 42 inches. The water table normally is 42 inches from the surface, but it rises during wet seasons. The soils are porous, and water moves rapidly through them. The moisture-holding capacity is low, and the soils are droughty during dry seasons or when they are overdrained. Most of the soluble minerals leach out of them rapidly.

The following soils are in capability unit IVsw–2:

Adamsville fine sand (0 to 2 percent slopes).
Adamsville fine sand, shallow phase (0 to 2 percent slopes).
Adamsville fine sand, dark colored surface phase (0 to 2 percent slopes).

Several factors limit the use of these soils. Seasonal wetness is a limitation that can be controlled adequately. More serious limitations are the unfavorable characteristics of the soil materials in the root zone. The low moisture-holding capacity, low fertility, and rapid leaching are also limiting. Erosion is not a problem.

Only a small acreage of these soils is under cultivation. The soils are suited to about the same crops and management as the soils of capability unit IVsw–1, but they vary somewhat in suitability for specific crops and in need for lime and fertilizer.

Improved pastures on these soils are of good quality. Various tame grasses can be grown. The principal management requirements are to use simple surface drainage, apply large amounts of fertilizer, and control grazing. With a good water-control system that includes irrigation, excellent pastures of grass-clover mixtures can be established. The soils require less lime than the soils of capability unit IVsw–1.

Most of the acreage is in native pasture. The areas in the eastern part of the county are near areas of soils of capability unit IVsw–1 and originally were covered by forests of pine. The areas in that location are slightly better suited to native pasture or pine forests than the other areas in capability unit IVsw–1, but they need similar management.

CAPABILITY UNIT IVse–1

In this capability unit are gently sloping, deep, droughty, sandy soils through which water moves rapidly. The surface layers consist of gray to grayish-brown fine sand. Under these are gray to yellowish-brown fine sand that extends to depths below 42 inches. These soils lie high above the water table, are very porous, and have a low moisture-holding capacity. Consequently, they are droughty and are leached of plant nutrients.

The following soils are in capability unit IVse–1.

Blanton fine sand, gently sloping high phase (5 to 8 percent slopes).
Lakeland fine sand, gently sloping phase (5 to 8 percent slopes).

These soils are similar to the soils of capability unit IIIse–1, but they have steeper slopes, which range from 5 to 8 percent. As a result, they are more limited in use suitability. The principal limitation results from the very sandy texture. If not managed properly, the soils are likely to erode. It is difficult to maintain the content of organic matter in the surface soil.

These soils are well suited to citrus crops and are used largely for that purpose. They are suited to about the same management practices as the soils of capability unit IIIse–1 but must be managed more carefully. In mature groves special treatment is needed to prevent rills and gullies from forming. A cover of plants between the trees helps to protect the soils.

These soils are not well suited to general farm crops and truck crops grown commercially. Except for small home gardens, only a small acreage is cultivated. If the soils are irrigated and fertilized heavily, they are well suited to home gardens and ornamentals. The gardens should be confined to the gentler slopes. By working crop residues and cover crops into the soil, the content of organic matter can be replenished.

These soils are moderately well suited to improved pasture. Bahiagrass, pangolagrass, and other deep-rooted grasses make good yields. Hairy indigo and other

drought-resistant legumes can be grown successfully, but good-quality pastures of grasses and clovers are difficult to establish and maintain. A high level of management that includes frequent fertilizing and liming is needed for good yields. Controlled grazing prevents the grasses from becoming stunted.

Though longleaf pine was once important on these soils, forestry is not important now. Most undeveloped areas that have scattered stands of pine and scrub oak could be used for citrus groves or for urban developments. If the areas are to be kept in forest, the open areas should be planted to slash pine. The trees need to be protected from fire and overgrazing and should be harvested selectively as they grow older.

CAPABILITY UNIT Vws–1

This capability unit consists of nearly level, wet, black, clayey soils that are flooded periodically. The soils occur mainly along the flood plains of the St. Johns and Wekiwa Rivers. They vary considerably in color and texture but are dominated by soils that have surface layers of black fine sandy clay. This material grades to a very plastic subsoil that is mottled with gray and extends to depths of more than 30 inches. The surface layers are high in organic matter and are neutral to alkaline in reaction.

These soils are generally very plastic, sticky, and slowly permeable; they stay wet most of the year. They are naturally fertile and have a high water-holding capacity.

The following soils are in capability unit Vws–1:

Manatee fine sandy clay loam (0 to 2 percent slopes).
Manatee and Delray soils, overflow phases (0 to 2 percent slopes).

These soils are limited in use suitability. They occur in low areas and are slowly permeable. Therefore, it is difficult to establish the water-control systems needed for cultivated crops. The surface layers are fine textured and can be tilled safely only within a narrow range of moisture content. The risk of periodic flooding also limits the use of the soils for cultivated crops.

Almost all of the areas are unimproved. About two-thirds of the acreage has a natural growth of wetland grasses and other marsh plants. If dikes and surface drains are installed and other intensive management is used, the soils can be reclaimed for good-quality improved pastures of tame grasses and clover. Moderate amounts of fertilizer are needed, and grazing must be controlled.

During much of the year, the native pastures are too wet for grazing, but during dry periods grazing is moderately good. If drainage is improved and if grazing is controlled to encourage the more desirable plants, good native pastures can be maintained.

A dense stand of wetland hardwoods, cabbage palmettos, shrubs, and vines covers more than a third of the acreage. The cost of clearing these areas is too high to make reclamation feasible. These areas provide shelter for many kinds of wildlife, and they can be developed further for that purpose.

CAPABILITY UNIT Vws–2

In this capability unit are nearly level, moderately wet, sandy soils that are shallow over marl. The soils are dominantly neutral in reaction. They have surface layers of gray to very dark gray fine sand that grades to fine sand of a lighter color. Marl is within 30 inches of the surface. The level of the water table fluctuates; in wet seasons it rises to near the surface. Only one mapping unit, Keri and Parkwood fine sands (0 to 2 percent slopes) is in this capability unit.

These soils are poorly suited to cultivated crops. Under good management they could be improved for pastures. Erosion is not a problem.

The soils are inextensive. They occur in small, isolated areas within larger tracts of soils of capability units IVsw–2 and IVws–2. None of the areas have been improved. About half of the acreage is covered by a dense stand of cabbage palmetto, oak and other wetland hardwoods, and an undergrowth of shrubs and vines. The rest has a sparse growth of pine, saw-palmetto, and native grasses similar to that on the soils of capability unit IVsw–1.

Open areas of these soils that adjoin areas of the soils in capability units IVsw–1 and IVsw–2 have similar suitability for improved and native pastures and require about the same management as the soils in the adjoining areas. Clearing the densely forested areas is expensive. Nevertheless, when these areas have been cleared, they produce good pastures if they are managed like the open areas. Uncleared areas furnish little forage but provide shelter for livestock and wildlife. Most of these areas should be kept in forest.

CAPABILITY UNIT Vsw–1

In this capability unit are deep, strongly acid soils that are light colored and that have a fluctuating water table within the root zone. Most of the areas are nearly level, but some are sloping. The thin surface layers of gray fine sand are underlain by nearly white fine sand that extends to depths of more than 30 inches. An organic pan usually occurs between depths of 30 and 60 inches. Normally, the level of the water table fluctuates between depths of 20 and 60 inches.

These soils are very porous, and water moves rapidly through the profile. The moisture-holding capacity is low. The soils are highly leached of plant nutrients. Only one soil, Pomello fine sand (0 to 5 percent slopes), is in capability unit Vsw-1.

This soil is seriously limited in use suitability. Even under intensive management, it is very droughty during dry seasons and too infertile for the cultivated crops common to this area. In wet seasons many areas are adversely affected by a high water table. Erosion is not a serious problem.

Moderately good yields are obtained on improved grass pastures if the soil is managed intensively. Bahiagrasses and other deep-rooting, drought-resistant grasses grow moderately well if heavily fertilized and if the areas are not overgrazed. Grazing must be controlled to encourage the recovery of plants.

Nearly half of this soil is occupied by undeveloped native pastures in which only a sparse growth of forage plants is obtained under good management. If the areas are grazed too heavily, the more desirable plants are eliminated and the soil becomes almost worthless for grazing.

This soil is moderately well suited to pine trees. The sparse stands of slash pine and longleaf pine that cover much of the soil could be improved by planting seedlings or by natural reseeding and by protecting the areas from fire and overgrazing.

CAPABILITY UNIT VIse–1

In this capability unit are deep, droughty, sandy soils that are subject to moderately severe erosion. The soils have gentle to strong slopes. Most of them are on slopes of more than 8 percent. The slopes are generally short and are near sinkholes and lakes.

The soils are similar to those of capability units IIIse–1 and IVse–1. They have gray to grayish-brown surface layers. They are low in natural fertility, in content of organic matter, and in water-holding capacity.

The following soils are in capability unit VIse–1:

Blanton fine sand, sloping high phase (8 to 12 percent slopes).
Blanton and Esto fine sands, gently sloping and sloping phases (5 to 12 percent slopes).
Lakeland fine sand, sloping phase (8 to 12 percent slopes).
Lakeland fine sand, strongly sloping phase (12 to 17 percent slopes).

These soils have characteristics that limit them severely in use suitability. They are subject to erosion if not managed properly. They can be cultivated safely only under very intensive management. Nevertheless, under good management the areas can be used, without risk, for native pastures and woodlands.

Most of these soils are in citrus groves or are in native vegetation. Some of the areas used for citrus crops erode severely unless they are managed carefully.

Although the soils are too steep to be used safely for citrus crops, these crops can be grown under very intensive management. It is particularly important that the trees in new groves be planted in rows across the slope. The trees should be planted far enough apart so that a cover crop can be grown between them after the citrus trees mature. In old groves special practices are needed to reduce runoff and check erosion. Tillage should be kept to a minimum. The trees can be hedged to permit more sunlight to penetrate the groves; this will encourage the growth of the cover crop.

The suitability and management of these soils for improved and native pastures and for forests is about the same as that described for the soils of capability unit IIIse–1.

CAPABILITY UNIT VIIs–1

In this capability unit are nearly level to rolling, deep, droughty, sandy soils of low fertility. The soils are mainly on slopes of 0 to 5 percent, but small areas near sinkholes and small lakes are on slopes of as much as 12 percent.

The surface layers consist of gray to light-gray fine sand. They are underlain, to a depth of more than 72 inches, by light-gray to white, almost pure quartz sand. The soils are very strongly acid to strongly acid. Only one soil, St. Lucie fine sand (0 to 5 percent slopes), is in capability unit VIIs–1.

This soil is extremely limited in use suitability. It is extremely porous and droughty and is high above the water table. It has been severely leached of plant nutrients. Water erosion is not a serious problem.

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This soil is not suited to cultivated crops or improved pastures. In some areas there are good native stands of sand pine. Natural reseeding of sand pine should be encouraged, and the areas need protection from fire. Slash pine and longleaf pine are not suited to this soil. Areas near lakes and towns are suitable as building sites.

UNCLASSIFIED MAPPING UNITS

Several miscellaneous land types, not suitable for farming, are in Orange County. These were not classified according to capability. Miscellaneous land types are areas that are flooded frequently, so that there has been little or no soil development; other areas that are inaccessible; and some areas from which soil has been removed.

Following is a list of the unclassified mapping units:

Alluvial land.
Borrow pits.
Fresh water swamp.
Made land.

On areas of Alluvial land and Fresh water swamp, there are water-tolerant trees, such as cypress and gum, and a few pines. Fair yields are obtained if the trees are harvested selectively and protected from fire. Natural reseeding should be encouraged.

The areas provide cover and some food for many kinds of wildlife. If the native plants are encouraged, the number of wildfowl and wild animals can be increased to some extent.

Areas of Made land are used principally as sites for houses and commercial buildings. Most of the areas are filled with dredgings obtained from the bottoms of ponds and lakes or with material from Borrow pits.

Estimated Yields

In table 3 are estimated average acre yields, at two levels of management, for the principal crops grown on the soils of Orange County.

The yields indicated in columns A were obtained under farming practices commonly used in 1956. These practices included a rather poorly defined system of cropping; moderate fertilization of vegetables, other crops, fruit trees, and pastures; and little or no use of fertilizer for corn and small grains, which receive only residual benefits from fertilizer applied to previous crops.

The estimates in columns B indicate average yields that may be obtained if more intensive management practices are used. These practices include using heavier and more frequent applications of fertilizer and lime; selecting crops and cropping systems carefully; using legumes and cover crops to increase the content of organic matter and nitrogen in the soils; providing adequate water control, including artificial drainage and irrigation; and cultivating carefully.

The estimates in table 3 are based primarily on interviews with farmers; with members of the staffs of the Agricultural Experiment Stations, the Agricultural Extension Service, and the College of Agriculture of the University of Florida; and with other persons who have had experience with the agriculture of the county.

TABLE 3.—*Estimated average acre yields of the*

[Yields in columns A are those to be expected under common management practices; those in columns B are to

Soil	Oranges		Grapefruit		Snapbeans		Cabbage		Celery	
	A	B	A	B	A	B	A	B	A	B
	Boxes	*Boxes*	*Boxes*	*Boxes*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Crates*	*Crates*
Adamsville fine sand	275	400	350	550	120	150	6	10	------	------
Dark colored surface phase	300	450	375	600	120	150	7	11	------	------
Shallow phase	275	400	350	550	120	150	6	10	------	------
Alluvial land	------	------	------	------	------	------	------	------	------	------
Blanton fine sand:										
Level high phase	375	600	450	700	100	125	------	------	------	------
Very gently sloping high phase	375	600	450	700	100	125	------	------	------	------
Gently sloping high phase	375	600	450	700	100	125	------	------	------	------
Sloping high phase	375	600	450	700	100	125	------	------	------	------
Level low phase	325	550	400	650	120	150	------	------	------	------
Very gently sloping low phase	325	550	400	650	120	150	------	------	------	------
Level shallow low phase	325	550	400	650	120	150	------	------	------	------
Blanton and Esto fine sand, gently sloping and sloping phases	350	575	425	675	100	125	------	------	------	------
Borrow pits	------	------	------	------	------	------	------	------	------	------
Brighton mucky peat:										
Shallow phase	------	------	------	------	150	175	8	12	700	900
Moderately deep phase	------	------	------	------	150	175	8	12	700	900
Deep phase	------	------	------	------	150	175	8	12	700	900
Very deep phase	------	------	------	------	150	175	8	12	700	900
Charlotte fine sand	------	------	------	------	120	150	8	12	------	------
Delray fine sand	------	------	------	------	175	225	7	11	600	800
Shallow phase	------	------	------	------	175	225	7	11	600	800
Delray mucky fine sand	------	------	------	------	200	250	9	13	650	800
Eustis fine sand:										
Level phase	400	625	500	750	------	------	------	------	------	------
Very gently sloping phase	400	625	500	750	------	------	------	------	------	------
Everglades mucky peat:										
Shallow phase	------	------	------	------	160	185	8	12	750	950
Moderately deep phase	------	------	------	------	160	185	8	12	750	950
Deep phase	------	------	------	------	160	185	8	12	750	950
Very deep phase	------	------	------	------	160	185	8	12	750	950
Felda fine sand	------	------	------	------	125	160	6	10	------	------
Fresh water swamp	------	------	------	------	------	------	------	------	------	------
Immokalee fine sand	------	------	------	------	100	125	5	7	------	------
Keri and Parkwood fine sands	275	400	350	550	125	160	7	11	------	------
Lakeland fine sand:										
Level phase	400	625	500	750	------	------	------	------	------	------
Very gently sloping phase	400	625	500	750	------	------	------	------	------	------
Gently sloping phase	400	625	500	750	------	------	------	------	------	------
Sloping phase	400	625	500	750	------	------	------	------	------	------
Strongly sloping phase	400	625	500	750	------	------	------	------	------	------
Leon fine sand	------	------	------	------	125	160	5	7	------	------
Level heavy substratum phase	------	------	------	------	140	175	6	8	------	------
Very gently sloping heavy substratum phase	------	------	------	------	140	175	6	8	------	------
Made land	------	------	------	------	------	------	------	------	------	------
Manatee fine sandy loam	------	------	------	------	200	250	9	13	600	800
Manatee fine sandy clay loam	------	------	------	------	200	250	9	13	600	800
Manatee and Delray soils, overflow phases	------	------	------	------	200	250	9	13	------	------
Ona fine sand	300	450	375	600	190	240	8	12	------	------
Orlando fine sand:										
Level phase	450	625	550	750	120	150	------	------	------	------
Very gently sloping phase	450	625	550	750	120	150	------	------	------	------
Pamlico muck	------	------	------	------	150	175	8	12	700	900
Plummer fine sand	------	------	------	------	100	125	5	7	------	------
Pomello fine sand	250	375	300	400	90	110	------	------	------	------
Pompano fine sand	------	------	------	------	125	160	6	10	------	------
Shallow phase	------	------	------	------	125	160	6	10	------	------
Overflow phase	------	------	------	------	125	160	6	10	------	------
Rutlege fine sand	------	------	------	------	160	185	7	11	------	------
Shallow phase	------	------	------	------	160	185	7	11	------	------
Rutlege mucky fine sand	------	------	------	------	160	185	8	12	600	800
St. Johns fine sand	------	------	------	------	140	175	6	8	------	------
St. Lucie fine sand	200	350	275	375	------	------	------	------	------	------
Scranton fine sand	375	600	450	700	200	250	8	12	------	------

[1] The term "cow-acre-days" is used to express the carrying capacity of pasture. It equals the number of days in a year that 1 acre will

principal crops under two levels of management

be expected under good management practices. Absence of yield figure indicates the crop is not commonly grown]

Sweet corn		Cucumbers		Lettuce		Endive and escarole		Radishes		Watermelons		Permanent improved pastures	
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Crates	*Crates*	*Bu.*	*Bu.*	*Crates*	*Crates*	*Crates*	*Crates*	*Bu.*	*Bu.*	*Number*	*Number*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
100	130	175	250	100	150	350	460	110	160	175	300	250	325
125	150	200	300	110	160	375	425	120	180	175	300	275	350
100	130	200	300	110	160	350	460	110	160	175	300	250	325
										290	400	125	230
										290	400	125	230
										290	400	125	230
										290	400	125	230
		140	250							290	400	200	275
		140	250							290	400	200	275
		140	250							290	400	200	275
										275	375	125	230
225	275			175	275	450	700	160	220			300	400
225	275			175	275	450	700	160	220			300	400
225	275			175	275	450	700	160	220			300	400
225	275			175	275	450	700	160	220			300	400
90	120	175	250	100	150	450	700	110	160			275	350
125	175	175	250	150	250	400	550	140	200			290	375
125	175	175	250	150	250	400	550	140	200			290	375
150	200	175	250	160	260	425	600	160	220			300	400
										290	400	125	220
										290	400	125	220
275	325			175	275	500	700	190	250			300	400
275	325			175	275	500	700	190	250			300	400
275	325			175	275	500	700	190	250			300	400
275	325			175	275	500	700	190	250			300	400
110	140	200	300	110	160	375	475	120	180			275	350
90	120	130	225	95	140	300	400	90	120	125	300	250	325
120	140	200	300	110	160	350	425	120	180			275	350
										290	400	125	220
										290	400	125	220
										290	400	125	220
										290	400	125	220
										275	375	125	220
90	120	125	225	95	140	300	400	90	120	175	300	200	275
100	130	130	225	95	140	325	425	100	150	175	300	250	325
100	130	130	225	95	140	325	425	100	150	175	300	250	325
150	200	175	250	160	260	425	600	150	200			300	400
150	200	175	250	160	260	425	600	150	200			300	400
150	200			160	260	425	600	150	200			300	400
125	150	200	300	130	160	375	475	120	160	225	325	275	350
		150	250							300	450	200	275
		150	250							300	450	200	275
225	275			160	260	425	600	160	220			300	400
85	110	130	225	100	150	300	400	100	150			225	300
										200	325	150	250
110	140	175	250	110	160	375	475	110	160			275	350
110	140	175	250	110	160	375	475	110	160			275	350
						375	475	110	160			275	350
120	170	175	250	130	160	400	550	125	190			290	375
120	170	175	250	130	160	400	550	125	190			290	375
125	175	175	250	150	200	425	600	150	210			300	400
100	130	130	225	100	140	325	425	100	150	175	300	275	350
125	150	200	300	140	175	400	500	125	180	290	425	275	350

provide grazing for 1 cow without injury to the pasture.

Engineering Properties of the Soils

This part of the soil survey report contains information about the soils of Orange County that will help engineers (1) select sites for buildings and other structures; (2) choose locations for highways and airports; (3) install sewage systems for septic tanks; (4) locate areas for sanitary fills; (5) determine the trafficability of soils; (6) locate sand and clay for use in construction and fills; and (7) plan dams, ponds, and other structures to control floods and conserve water and soil.

The soil map and the descriptive report are too generalized for some engineering purposes. Nevertheless, they provide valuable information for planning tests and detailed field surveys. The tests and field surveys will help in determining the in-place condition of soils at proposed sites of engineering construction. After testing the soil materials and observing their behavior in dif-

TABLE 4.—*Engineering properties*

Soil	Description of soil and underlying material	Natural drainage	Depth to water table [1]	Permeability	Suitability as source of topsoil [2]	
			Feet		*Surface soil*	*Subsoil*
Adamsville fine sand	Moderately thick deposits of sand (SP;[4] A–3[5]); occurs on low, broad, flat ridges.	Somewhat poor	1 to 2	Rapid	Fair	Poor
Adamsville fine sand, shallow phase.	Moderately thick deposits of sand (SP; A–3) underlain by unconsolidated clayey material (SM; A–2–4) at depths of 30 to 42 inches; occurs on low, broad, flat ridges.	Somewhat poor	1 to 2	Rapid in sandy materials; moderate in clayey materials.	Fair	Fair
Blanton fine sand, level high phase.	Moderately thick deposit of sand (SP; A–3); occurs on ridges.	Good to somewhat excessive.	4 to 6	Rapid	Fair	Poor
Blanton fine sand, level low phase.	Moderately thick deposit of sand (SP; A–3); occurs on ridges.	Moderately good.	2 to 3	Rapid	Fair	Poor
Blanton fine sand, level shallow low phase.	Moderately thick deposits of sand (SP; A–3); unconsolidated clayey material (SM; A–2–4) at depths of 30 to 42 inches; occurs on low ridges.	Moderately good.	2 to 3	Rapid in sandy materials; moderate in clayey materials.	Fair	Poor
Brighton mucky peat, shallow phase.	Remains of decayed lilies, bonnets, and aquatic plants, 12 to 36 inches thick; usually underlain by sands.	Very poor	Inundated	Variable, but mainly moderate.	Good for increasing organic matter in mineral soils.	Fair to poor.
Charlotte fine sand	Moderately thick deposits of sand (SP; A–3); occurs in flat, broad sloughs, or depressions.	Poor	Inundated	Rapid	Fair	Fair to poor.
Delray fine sand	Moderately thick deposits of sand; high content of fine organic material (SC; A–2–4).	Very poor to poor.	Inundated	Rapid	Good	Fair
Delray fine sand, shallow phase.	Sandy materials underlain by unconsolidated clayey materials at depths of 30 to 42 inches (SM; A–2–4); occurs in low, wet areas.	Very poor to poor.	Inundated	Rapid in sandy materials; moderate in clayey materials.	Good	Fair
Eustis fine sand, level phase.	Thick deposits of sand (SP; A–3); occurs on high ridges.	Somewhat excessive.	More than 10.	Rapid	Fair	Poor
Everglades mucky peat, shallow phase.	Remains of sawgrass, lilies, sedges, and grasses over alkaline materials; organic materials, 12 to 36 inches thick, underlain by sands or sandy clays.	Very poor	Inundated	Variable, but mainly moderrate.	Good for increasing organic matter in mineral soils.	Fair to poor.
Felda fine sand	Thin deposits of sand over alkaline clayey materials; less than 30 inches of sand (SP; A–2–4) over fine sandy loam or fine sandy clay loam (SC; A–2–4); occurs on broad, flat sloughs or depressions.	Poor	Inundated	Rapid in sandy materials; moderate in clayey materials.	Fair	Fair

See footnotes at end of table.

ferent places and under varying conditions, the engineer can anticipate with fairly reasonable accuracy the properties of individual soils, wherever they are mapped.

Engineering Data

Engineering properties of representative soils of each series mapped in Orange County are shown in table 4. This table, which shows the in-place condition of the soil material, was prepared mainly for use in agricultural engineering, but it also contains information important to other fields of engineering. Some of the soil information needed by engineers can be obtained from the soil map in the back of the report. Additional information can be obtained by referring to other sections of the report, particularly the sections, Descriptions of Soils; Genesis, Morphology, and Classification of Soils; and General Nature of the Area.

of representative soils

Shrink-swell potential [3]	Suitability for earthwork during prolonged wet periods	Features affecting—			
		Dikes	Excavated ponds	Irrigation	Drainage systems for septic tanks
Low	Fair	Moderately thick, porous sand over clayey materials.	Shallow water table	Low moisture-holding capacity; level relief.	Shallow water table (rated poor).
Low in sandy materials; low to moderate in clayey materials.	Fair	Moderately thick, porous sand over clayey materials.	Shallow water table	Low moisture-holding capacity; level relief.	Shallow water table (rated poor).
Low	Good to fair	Moderately thick, porous sand.	High elevation	Low moisture-holding capacity.	Deep water table (rated good).
Low	Fair to good	Moderately thick, porous sand.	Medium elevation	Low moisture-holding capacity.	Moderately deep water table (rated good).
Low in sandy materials; low to moderate in clayey materials.	Fair to good	Moderately thick, porous sand with clayey materials beginning at depths of 30 to 42 inches.	Medium elevation	Low moisture-holding capacity in sandy horizons; moderately deep water table.	Moderately deep water table (rated good).
High in organic horizon; low in mineral horizon.	Very poor	Subsidence of soil materials by drying and oxidation.	Inundated areas; organic materials.	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
Low	Poor	Moderately thick, porous sand.	Inundated areas	Low moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).
Low	Poor	Moderately thick, porous sand; high in organic matter.	Inundated areas	High moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).
Low in sandy materials; moderate in clayey materials.	Poor	Moderately thick, porous sand underlain by clayey materials at depths of 30 to 42 inches; high in organic matter.	Inundated areas	High moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).
Low	Good	Thick, porous sand	High elevations; very deep water table.	Low moisture-holding capacity; very deep water table.	Very deep water table (rated good).
High in organic horizons; low to moderate in mineral horizons.	Very poor	Subsidence of soil materials by drying and oxidation.	Inundated areas; organic materials.	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
Low in sandy materials; moderate in clayey materials.	Poor	Shallow to clayey materials.	Clayey subsoil; inundated areas.	Adequate permeability in subsoil; very shallow water table.	Very shallow water table (rated very poor).

TABLE 4.—*Engineering properties*

Soil	Description of soil and underlying material	Natural drainage	Depth to water table [1]	Permeability	Suitability as source of topsoil [2]	
			Feet		*Surface soil*	*Subsoil*
Immokalee fine sand	Moderately thick deposits of sand (SP; A–3); organic pan, at depths of 30 to 60 inches, contains small amount of fine organic matter; occurs on low, broad, flat ridges.	Somewhat poor	1 to 2	Rapid	Fair	Poor
Keri and Parkwood fine sands.	Thin deposits of sand (SP; A–3) underlain by marl (SM; A–2–4); occur on low, broad flats and support cabbage palmetto and other trees.	Somewhat poor	1 to 2	Rapid	Fair	Poor to fair.
Lakeland fine sand, very gently sloping phase.	Thick deposits of sand (SP; A–3); occurs on high ridges.	Somewhat excessive.	More than 10.	Rapid	Fair	Poor
Leon fine sand	Moderately thick deposits of sand (SP; A–3); contains an organic pan (SP; A–2–4) at depths of 14 to 30 inches.	Somewhat poor	1 to 2	Rapid	Fair	Poor
Leon fine sand, level heavy substratum phase.	Moderately thick deposits of sand; has clayey materials (SM; A–2–4) at depths of 30 to 42 inches; occurs on broad, flat areas.	Somewhat poor	1 to 2	Rapid in sandy materials; moderate in clayey materials.	Fair	Poor
Manatee fine sandy loam.	Thin surface layer of fine sandy loam (SM; A–2–4) over sandy clay loam or sandy clay (SM; A–2–4) that is plastic when wet; occurs in low, wet areas.	Poor to very poor.	Inundated	Rapid in surface layer; moderate to slow in clayey materials.	Good	Fair
Manatee fine sandy clay loam.	Thin surface layer of fine sandy clay loam over sandy clay (SM; A–2–4).	Poor to very poor.	Inundated	Moderate in surface layer; moderate to slow in underlying materials.	Good	Fair
Manatee and Delray soils overflow phases.	Variable; similar locally to other Manatee and Delray soils; occur along major streams and are subject to periodic overflow.	Poor to very poor.	Inundated	Moderate in surface layer; moderate to slow in underlying materials.	Good	Fair
Ona fine sand	Moderately thick deposits of sand (SP; A–3); 8- to 12-inch surface layer has moderate to high content of organic matter; occurs on low, broad, flat ridges.	Somewhat poor	1 to 2	Rapid	Good	Fair
Orlando fine sand, level phase.	Thick deposits of sand (SP; A–3); 9- to 15-inch surface layer has moderate to high content of organic matter; occurs on high, broad ridges.	Good	3 to 5	Rapid	Good	Fair
Pamlico muck	Organic soil, 12 to 60 inches thick, derived from aquatic plants; underlain by sands (SP; A–3); occurs in depressions or in low, wet areas.	Very poor	Inundated	Moderate to rapid	Good for increasing organic matter in mineral soils.	Fair to poor.
Plummer fine sand	Moderately thick deposits of sand (SP; A–3); occurs in depressions or in low, wet areas.	Poor	Inundated	Rapid	Fair	Poor
Pomello fine sand	Thick deposits of nearly white sand (SP; A–3); occurs on low ridges.	Somewhat poor	1 to 3	Rapid	Poor	Poor
Pompano fine sand	Moderately thick deposits of sand (SP; A–3); occurs in depressions or in low, wet areas.	Poor	Inundated	Rapid	Fair	Poor

See footnotes at end of table.

of representative soils—Continued

Shrink-swell potential [3]	Suitability for earthwork during prolonged wet periods	Features affecting—			Drainage systems for septic tanks
		Dikes	Excavated ponds	Irrigation	
Low	Fair	Moderately thick sand	Shallow water table	Rapid permeability; level relief; low moisture-holding capacity; shallow water table.	Shallow water table (rated poor).
Low	Fair	Thin deposits of sand over marl.	Shallow water table	Low moisture-holding capacity; level relief.	Shallow water table (rated poor).
Low	Good	Thick, porous sand	High elevations; very deep water table.	Low moisture-holding capacity; very deep water table; sloping areas.	Very deep water table (rated good).
Low	Fair	Moderately thick, porous sand.	Shallow water table	Low moisture-holding capacity; shallow water table.	Shallow water table (rated poor).
Low in sandy materials; moderate in clayey materials.	Poor	Moderately thick, porous sand with clayey materials beginning at depths of 30 to 42 inches.	Shallow water table; clayey subsoil.	Low moisture-holding capacity; shallow water table.	Shallow water table (rated poor).
Moderate in surface layer, which is moderate to high in organic matter; moderate to high in clayey materials.	Poor	Shallow to clayey materials; high in organic matter in surface layer.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Slowly permeable; very shallow water table (rated very poor).
Moderate to high	Poor	Shallow to clayey materials; high in organic matter in surface layer.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Slowly permeable; very shallow water table (rated very poor).
Moderate to high	Poor	Shallow to clayey materials; high in organic matter in surface layer.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Slowly permeable; very shallow water table (rated very poor).
Low	Fair	Moderately thick, porous sand.	Shallow water table	Low moisture-holding capacity; shallow water table.	Shallow water table (rated poor).
Low	Good	Thick, porous sand	High elevations; deep or very deep water table.	Rapid permeability; medium moisture-holding capacity.	Deep or very deep water table (rated good).
High in organic horizon; low in mineral horizons.	Very poor	Subsidence of soil materials by drying and oxidation.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
Low	Very poor	Moderately thick, porous sand.	Inundated areas; very shallow water table.	Low moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).
Low	Fair	Thick, porous sand	Medium elevations; shallow water table.	Low moisture-holding capacity; shallow water table.	Shallow water table (rated fair).
Low	Poor	Moderately thick, porous sand over clayey materials.	Inundated areas	Low moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).

TABLE 4.—*Engineering properties*

Soil	Description of soil and underlying material	Natural drainage	Depth to water table[1]	Permeability	Suitability as source of topsoil[2]	
			Feet		*Surface soil*	*Subsoil*
Pompano fine sand, shallow phase.	Moderately thick deposits of sand (SP; A–3) underlain by clayey materials at depths of 30 to 42 inches; occurs in depressions or in low, wet areas.	Poor	Inundated	Rapid in sandy materials; moderate in clayey materials.	Fair	Poor
Rutlege fine sand	Surface soil, 9 to 18 inches thick, of fine sand (SM; A–2–4) with a high content of organic matter; underlain by moderately thick deposits of sand (SP; A–3); occurs in low, wet areas.	Poor to very poor.	Inundated	Rapid	Good	Fair
Rutlege fine sand, shallow phase.	Similar to Rutlege fine sand but underlain by clayey materials (SM; A–2–4) at depths of 30 to 42 inches; occurs in low, wet areas.	Poor to very poor.	Inundated	Rapid in sandy materials; moderate in clayey materials.	Good	Fair
Rutlege mucky fine sand.	Surface soil, 4 to 12 inches thick, of mucky fine sand (SM; A–2–4) with a high content of organic matter; underlain by moderately thick deposits of sand (SP; A–3).	Poor to very poor.	Inundated	Rapid	Good	Fair
St. Johns fine sand	Moderately thick deposits of sand (SP; A–3); high content of organic matter in surface layer; occurs in flat areas.	Somewhat poor	1 to 2	Rapid	Good	Poor
St. Lucie fine sand	Thick deposits of dry, nearly white sand (SP; A–3); occurs on high ridges.	Excessive	More than 10.	Rapid	Poor	Poor
Scranton fine sand	Moderately thick deposits of sand (SP; A–3) with moderate to high content of organic matter in surface layer; occurs on low, flat ridges.	Somewhat poor	1 to 2	Rapid	Good	Fair

[1] Minimum depth to water table during wettest periods.
[2] Refers to suitability of topsoil for supporting vegetation. Determined chiefly by the content of organic matter and by the texture of the soil material.
[3] Determined chiefly by the amount and kind of clay in the profile.

Engineering Interpretations

Table 4 gives information about the textural characteristics and parent materials of the soils. This information is useful in locating materials for construction purposes. Such characteristics as the kind, depth, and amount of clay, and the depth to the water table affect the percolation rates of soils. This is important in areas in which there are sewage systems for septic tanks. Many of the nearly level soils have a water table that fluctuates from near the surface to depths between 48 and 60 or more inches. The level of the water table is usually highest after heavy summer rains and may prevent effective operation of the sewage system.

Poorly drained soils, especially those high in organic matter, are unsuitable for most types of construction. In roadbuilding it is particularly important to know the location of poorly drained soils and the degree of expansion and contraction of the underlying clays. Seepage along the back slopes of cuts in poorly drained soils may result in the slumping or sliding of the underlying material. If feasible, these wet areas should be bypassed when building roads.

Where cuts are made in poorly drained areas or in areas of clays that have a high swelling potential, the excavated material should not be used as fill for embankments. Suitable fill from other areas can be used for embankments and foundations below gradeline. Clays that have a high swelling potential are likely to damage the road if used for roadbeds.

Several soils in the nearly level areas of the county have a perched water table. If there is a perched water table beneath the road pavement, the foundation material may be damaged. Poorly drained areas should be inspected in detail to determine the need for artificial drainage.

Genesis, Morphology, and Classification of Soils

Soil is the product of the forces of soil development acting on parent material deposited or accumulated

of representative soils—Continued

Shrink-swell potential[3]	Suitability for earthwork during prolonged wet periods	Features affecting—			
		Dikes	Excavated ponds	Irrigation	Drainage systems for septic tanks
Low in sandy materials; low to moderate in clayey materials.	Poor	Moderately thick, porous sand over clayey materials.	Inundated areas	Low moisture-holding capacity; very shallow water table.	Very shallow water table (rated very poor).
Low	Very poor	Moderately thick, porous sand.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
Low in sandy materials; low to moderate in clayey materials.	Very poor	Moderately thick, porous sand over clayey materials.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
High in surface layer; low in lower horizons.	Very poor	Moderately thick, porous sand; organic matter oxidizes rapidly.	Inundated areas	Very shallow water table; high moisture-holding capacity.	Very shallow water table (rated very poor).
Low	Fair to poor	Moderately thick, porous sand.	Shallow water table	Shallow water table	Shallow water table (rated very poor).
Low	Good	Thick, porous sand	High elevations; very deep water table.	Low moisture-holding capacity; very deep water table.	Very deep water table (rated good).
Low	Fair	Moderately thick, porous sand.	Shallow water table	Shallow water table; medium moisture-holding capacity; level relief.	Shallow water table (rated fair).

[4] Ratings for soil materials according to The Unified Soil Classification System, Tech. Memo. No. 3–357, v. 1, 2, and 3. Waterways Experiment Station, Corps of Engineers, 1953 (*11*).

[5] Ratings for soil materials according to Standard Specifications for Highway Materials and Methods of Sampling and Testing (pt. 1, ed. 7): The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145–49 (*1*).

through geologic agencies. These forces are (1) the type of parent material; (2) the climate under which the soil material has accumulated and has since existed; (3) the relief or lay of the land; (4) the plant and animal life in and on the soil; and (5) the length of time the four forces already mentioned have acted on the soil material (*9*).

The five soil-forming factors are interdependent; each modifies the effects of the others. Climate and vegetation are the active factors that change the parent material and from it gradually form soil. Relief largely controls runoff and therefore influences the effectiveness of climate and vegetation. Time is needed for changing the parent material into a soil profile.

Factors of Soil Formation

The kind of parent material and the degree of drainage account for the principal differences among the soils of Orange County. Following is a discussion of the influence of the various factors in the formation of the soils.

Parent material

Five times during the Pleistocene epoch the sea rose high enough to cover the area that is now Orange County (*2*). During each of these periods, the sea left a mantle of sand over the earlier deposits. Locally, clay and silt were deposited in former estuaries and were covered by sands of a later period. In places recent accumulations of organic material have covered the sands.

The combined thickness of the layers of sand ranges from a few inches to 200 or more feet. In this county the Sunderland terrace is the oldest exposed formation of the Pleistocene epoch. It occurs in the central and western parts of the county at elevations of 100 to 170 feet above the present sea level. Some of the soils at higher elevations have formed mainly from the sediments of sand and clay contained in this formation. The red and yellowish-red sands and clays that lie at shallow depths under the mantle of sand in the northwestern part of the county may be part of the Citronelle formation of the Pliocene epoch. At Rock Springs, 6 miles north of Apopka, is an exposure of the Hawthorn formation of the Miocene epoch.

Younger formations that are distinguishable in some locations are the Wicomico, on terraces at elevations of 70 to 100 feet; the Penholoway, at elevations of 42 to 70 feet; the Talbot, at elevations of 25 to 42 feet; and the Pamlico, which is less than 25 feet above the present sea level. In places some of the formations are so thin that they are difficult to distinguish.

The Pamlico formation lies a few miles west of the St. Johns River in the eastern part of the county. It consists of thin deposits of sand and a few areas of alkaline clay over marl. The clay and marl are believed to belong to the Caloosahatchee formation of the Pliocene epoch.

The Talbot, Penholoway, and Wicomico formations gradually become evident west of the Pamlico formation. The upper boundary of the Wicomico formation forms a cape southeast of Orlando. It cuts sharply to the west and follows the eastern side of the ridge to the southwestern corner of Orange County.

During recent times, organic deposits have formed from decomposed plant remains in areas north of Lake Apopka, near Lake Hart and Lake Mary Jane, and in other low, wet areas. These deposits vary in thickness.

Climate

The soils of Orange County have formed under the influence of a humid, subtropical climate. The average annual temperature is about 72° F.; the annual precipitation is about 51 inches. Most of the precipitation falls between May and October. The rainfall is comparatively light during winter and early in spring.

Because of the favorable climate and high rainfall, many plants grow, even during the winter months, and animals are active. The high rainfall, however, has leached much of the plant nutrients from the soil. Consequently, many of the sandy soils have become strongly acid to very strongly acid. In some soils the surface layer is acid and is underlain by alkaline, clayey materials or by marl.

Vegetation

The county was once covered by forests that consisted mainly of pine but that included some cypress trees and hardwoods. The undergrowth in the pine forests was made up of short grasses, sedges, and many saw-palmettos and other shrubs. In low, wet areas a few shrubs, sedges, grasses, and aquatic plants grew alone or mixed with cypress, gum, oak, maple, and bay. Cabbage palmetto grew in areas where the soil was alkaline.

Topography

Elevations range from 15 feet above sea level, along the St. Johns River in the eastern edge of the county, to 150 feet at Apopka, in the northwestern part. The eastern two-thirds of the county and the southern part are mainly level or nearly level, but there are a few, short, steep slopes near streams and lakes. The western and northwestern parts of the county are gently undulating to rolling. A few areas around sinkholes or lakes have slopes of nearly 25 percent.

On the broad, nearly level plains, most of the soils are somewhat poorly drained or poorly drained. On a few, low ridges or knolls, the soils are moderately well drained. The areas contain only a few distinct streams or drainageways. Most of the excess surface water passes through the depressions and low, wet areas or through canals and ditches to the larger streams. In the eastern part of the county, the surface water drains into Taylor Creek, James Creek, Tootoosahatchee Creek, and the Econlockhatchee River, which all flow into the St. Johns River. In the southern part of the county, the surface water drains into tributaries of the Kissimmee River.

The undulating and rolling uplands are drained by short streams that flow into wet, low areas or lakes and by a few continuous streams that lead from the uplands. Much of the surface water seeps through the sand and drains into the many lakes, ponds, and sinkholes. As a result, the soils in this part of the county are dominantly well drained to somewhat excessively drained.

Time

Most of the soils in Orange County are young. The soil-forming processes have not acted on the parent materials long enough for distinct horizons to have developed. Only the Leon, Immokalee, and St. Johns soils are considered to have a B horizon. In these soils the B horizon is an organic pan that consists mainly of sand with an accumulation of fine organic matter and a small amount of fine minerals within the interstices.

Classification of Soils by Great Soil Groups

The lower categories of soil classification—phases, types, and series—are explained in the section, Soil Survey Methods and Definitions. Briefly, a soil type consists of one or more phases, and a soil series consists of one or more soil types. Soil types and phases are the units shown on the detailed soil map.

Soil series are classified into a higher category, the great soil groups. Each great soil group is made up of soils that have certain internal characteristics in common (*6*, *9*). The great soil group to which each of the soil series in Orange County belongs is shown in the following list:

Great soil group	*Soil series*
Ground-Water Podzols	Leon, Immokalee, St. Johns, Ona, Pomello.
Low-Humic Gley soils	Keri, Parkwood, Pompano, Charlotte, Felda, Plummer, Esto.
Humic Gley soils	Rutlege, Delray, Manatee, Scranton.
Bog soils	Everglades, Brighton, Pamlico.
Regosols	Adamsville, Lakeland, Blanton, Eustis, Orlando, St. Lucie.

Miscellaneous land types are not classified within great soil groups. In Orange County the miscellaneous land types are Alluvial land, Borrow pits, Fresh water swamp, and Made land.

Ground-Water Podzols

The Ground-Water Podzols have a thin, organic layer that overlies a strongly leached, light-gray, sandy layer. This is underlain by a black or dark grayish-brown organic pan. The soils have formed from sandy materials under the influence of a humid climate. They have somewhat poor to poor drainage. The Leon, Immokalee, St. Johns, Ona, and Pomello soils are classified as Ground-Water Podzols.

LEON SERIES

The Leon soils have formed in moderately thick beds of unconsolidated sand. They are level to gently sloping and are somewhat poorly drained.

These soils have a pan layer in which organic matter and minerals have accumulated, and this may be defined as a B horizon. During many months of the year, the water table remains near the level of the pan, which begins at depths of 14 to 30 inches. The black, organic pan is very strongly acid; the rest of the profile is strongly acid.

A profile of Leon fine sand, typical of the Ground-Water Podzols in this county, was observed in a nearly level, forested area about 1 mile southwest of Ocoee (SE. corner of the SW¼NE¼ sec. 24, T. 22 S., R. 27 E.). The following describes this profile:

- A_p 0 to 6 inches, very dark gray (10YR 3/1), nearly loose fine sand; contains a small to medium amount of partly decayed organic matter mixed with light-gray grains of sand that give it a salt-and-pepper appearance; contains many fibrous, medium-sized roots.
- A_{21} 6 to 12 inches, gray (10YR 5/1), loose fine sand with a few streaks of dark gray.
- A_{22} 12 to 20 inches, light-gray (10YR 7/1), loose fine sand with a few streaks of light brownish gray around partly decayed roots.
- B_{2h} 20 to 22 inches, black (10YR 2/1) fine sand that is cemented by organic matter; hard when dry; firm to friable when moist.
- B_3 22 to 30 inches, dark-brown (10YR 3/3) fine sand; weakly cemented; very friable when moist.
- C 30 to 48 inches +, pale-brown (10YR 6/3), loose fine sand with a few spots of dark brown and yellowish brown.

IMMOKALEE SERIES

Like the Leon soils, the Immokalee soils have formed in moderately thick beds of sand. They are nearly level and are somewhat poorly drained. Except that the organic pan is only weakly cemented and begins at depths of 30 to 42 inches, the profile of Immokalee fine sand resembles closely that of Leon fine sand.

ONA SERIES

The soils of the Ona series have formed in moderately thick beds of sand. They are nearly level and are somewhat poorly drained to poorly drained. Ona fine sand, the only soil of the Ona series mapped in this county, occurs with the Leon and Scranton soils.

Ona fine sand has a comparatively thick, black or very dark gray surface layer underlain, within 14 inches of the surface, by an organic-stained layer. In contrast, the Leon soils have a subsurface layer of light gray or white fine sand. The subsurface layer overlies the black or dark-brown organic pan, which occurs at a depth of more than 14 inches.

ST. JOHNS SERIES

The St. Johns soils have formed in moderately thick deposits of acid sands. They are poorly drained to somewhat poorly drained. St. Johns fine sand is the only soil of this series mapped in the county. It has a black surface horizon, 8 to 15 inches thick, that is generally underlain by a leached horizon; below this is a black or dark-brown organic pan. The St. Johns soil commonly is at lower elevations than the Leon, Immokalee, and Ona soils.

POMELLO SERIES

The Pomello soils are classified as Ground-Water Podzols, but they have some characteristics of Regosols. The Pomello soils, represented in Orange County by Pomello fine sand, are strongly to very strongly acid. They have formed in thick deposits of sand. These soils are moderately well drained to somewhat poorly drained. The thin, light-gray or gray surface layer is underlain by nearly white sand that extends to a depth of 30 inches or more. A black or dark-brown organic pan occurs at depths between 30 and 60 inches. The Pomello soil occurs at slightly lower elevations than the St. Lucie soil. It is not so rapidly drained and is shallower to ground water. The Pomello soil is better drained and has a lighter colored surface layer than the Leon and Immokalee soils.

Low-Humic Gley soils

The Low-Humic Gley soils are somewhat poorly drained to poorly drained. They have a thin surface layer that contains a moderate amount of organic matter. This overlies gleylike mineral horizons that are mottled with gray, yellow, and brown. Textural differences are not clearly defined in these horizons. The Pompano, Keri, Parkwood, Esto, Charlotte, Felda, and Plummer soils are the Low-Humic Gley soils in Orange County.

POMPANO SERIES

The Pompano soils are poorly drained. They have formed in moderately thick deposits of sands over alkaline materials. The upper part of the profile is medium acid to neutral, and the deeper horizons are neutral or alkaline. Pompano fine sand consists of fine sand to depths of more than 42 inches. The shallow phase of this soil has fine-textured materials beginning at depths of 30 to 42 inches. Both of these soils occur in level areas or in slight depressions. Pompano fine sand, overflow phase, has a profile similar to that of the shallow phase. It is flooded frequently by the adjacent St. Johns River. Usually, during wet seasons, the soils are covered by a few inches of water.

The following describes a profile of Pompano fine sand, observed in a native pasture of short grasses (SE¼ of sec. 22, T. 23 S., R. 34 E.):

- A_1 0 to 5 inches, dark-gray (10YR 4/1), nearly loose fine sand; very weak, fine, granular structure to single grain (structureless); slightly acid.
- A_{21} 5 to 14 inches, gray (10YR 5/1), loose fine sand; single grain; slightly acid.
- A_{22} 14 to 21 inches, light brownish-gray (10YR 6/2), nearly loose fine sand; single grain; neutral.
- C 21 to 44 inches, pale-brown (10YR 6/3), loose fine sand with a few, faint streaks of light gray (10YR 7/1); neutral.
- D 44 to 48 inches +, mottled gray (5Y 5/1) and pale-yellow (2.5Y 7/4), friable fine sandy clay loam; mildly alkaline.

KERI AND PARKWOOD SERIES

The Keri and Parkwood soils have similar characteristics and occur only in small areas. Therefore, in Orange County these soils have been mapped as an undifferentiated soil group of Keri and Parkwood fine sands.

The Keri soil is somewhat poorly drained. It has formed from moderately thin, stratified deposits of

marine sands and marl. The surface layer is thin and consists of dark gray or very dark gray, nearly loose fine sand that contains a moderate amount of organic matter. The subsurface layer is made up of light-gray or light brownish-gray, loose fine sand. A 2- to 12-inch layer of light-gray marl that has a sandy loam texture occurs between depths of 12 and 30 inches. Immediately below the marl is light-gray or white, loose fine sand that is mottled with yellow. The fine sand extends to a depth of 48 inches or more.

The Parkwood soil is somewhat poorly drained to poorly drained. It has formed in thin deposits of sand that overlie thick deposits of marl. The horizons above the marl are similar to those of Keri fine sand.

CHARLOTTE SERIES

Charlotte fine sand is the only soil of the Charlotte series mapped in Orange County. This soil differs from Pompano fine sand in that it has brownish-yellow or reddish-yellow to yellow fine sand between depths of 12 and 30 inches. The surface layer is dark grayish brown to very dark gray and is 2 to 8 inches thick. The subsurface horizon is light brownish gray or light gray. The brownish-yellow or reddish-yellow to yellow material is 12 to 20 inches thick and is underlain by a layer of mottled pale-brown, light-gray, and yellow fine sand. The mottles become smaller and fewer in number with increasing depth.

FELDA SERIES

Felda fine sand, the only soil of this series mapped in the county, occurs in level or slightly depressed areas. The soil is poorly drained. It has formed in thin deposits of sand that overlie alkaline, clayey materials. In contrast to the Pompano soils, which have sand to a depth of 30 or more inches, the Felda soil has fine sandy loam or fine sandy clay loam within 30 inches of the surface. In color, the horizons of the Felda soil are similar to corresponding horizons of Pompano fine sand, shallow phase.

PLUMMER SERIES

Plummer fine sand is the only soil of the Plummer series mapped in Orange County. This soil is strongly to very strongly acid throughout, whereas Pompano fine sand is medium acid to neutral in the upper horizons and neutral or alkaline in the deeper horizons. These two soils are similar in other profile characteristics.

ESTO SERIES

Esto fine sand, the only soil of the Esto series in Orange County, is mapped with Blanton fine sand in an undifferentiated soil group. Its surface layer of loose fine sand ranges from grayish brown to very dark gray in color and from 3 to 6 inches in thickness. Beneath this is very pale brown to yellow, loose fine sand. Clayey material begins at depths of 18 to 30 inches.

Humic Gley soils

The Humic Gley great soil group consists of poorly drained to very poorly drained, hydromorphic soils. The soils have moderately thick, dark-colored, organic-mineral horizons that are underlain by mineral-gley horizons.

The Humic Gley soils in Orange County are in the Rutlege, Delray, Manatee, and Scranton series. The soils of these series occur in level areas or in slight depressions, and they receive seepage from higher lying areas. Many areas are covered by a few inches of water during several months of the year.

RUTLEGE AND DELRAY SERIES

The soils of the Rutlege and Delray series have formed in moderately thick deposits of sand. The Rutlege soils are strongly acid to very strongly acid throughout. The Delray soils have medium acid to neutral upper horizons and neutral or alkaline lower horizons. The modal profile of the soils of both series consists of fine sand to a depth of more than 42 inches. Within both the Rutlege and Delray series are shallow phases in which fine-textured materials begin at depths between 30 and 42 inches. Both series include a mucky fine sand, the surface layer of which contains a considerable amount of organic matter.

The following describes a profile of Rutlege fine sand observed in a cypress pond near the south side of NE¼SW¼ sec. 11, T. 23 S., R. 30 E.:

- A_1 0 to 12 inches, black (10YR 2/1), nearly loose fine sand; contains a large amount of organic matter; strongly acid.
- A_3 12 to 18 inches, dark-gray (10YR 4/1), loose fine sand; strongly acid.
- C_{11} 18 to 36 inches, light-gray (10YR 7/2), loose fine sand; strongly acid.
- C_{12} 36 to 48 inches +, light-gray (10YR 7/1), loose fine sand with a few, fine, distinct mottles of pale yellow (2.5Y 7/4) and brownish yellow (10YR 6/8); strongly acid.

MANATEE SERIES

The Manatee soils have formed in thin deposits of sand that overlie alkaline, clayey materials. In most places the clayey materials are underlain by marl. These soils occur in level areas or in slight depressions and are covered frequently by a few inches of water during several months of the year. In contrast to the Delray soils, which consist of sandy materials to depths of more than 30 inches, they have fine sandy clay loam or fine sandy clay within 30 inches of the surface. The upper part of the profile is slightly acid to neutral, and the lower part is neutral or alkaline.

In Orange County the Manatee series is represented by two soil types—fine sandy loam and fine sandy clay loam—and is also included in the undifferentiated soil group, Manatee and Delray soils, overflow phases. The overflow phases are flooded frequently by the adjacent St. Johns and Wekiwa Rivers.

Manatee fine sandy loam has a black to dark-gray surface layer, 9 to 18 inches thick. This is underlain by gray or light-gray fine sandy loam that grades to fine sandy clay loam or fine sandy clay within 30 inches of the surface. Commonly, marl of sandy clay loam texture occurs within 48 inches of the surface.

SCRANTON SERIES

Scranton fine sand, the only soil of the Scranton series mapped in Orange County, is nearly level. It is somewhat poorly drained to poorly drained. It occurs at higher elevations and is better drained than the Rutlege soils. This soil is strongly acid to very strongly

acid. It has some characteristics of the Red-Yellow Podzolic soils.

The following describes a profile of Scranton fine sand observed in a forested area, about 0.7 mile south of Conway near the NE. corner of SW¼NW¼ sec. 17, T. 23 S., R. 30 E.:

A_1 0 to 10 inches, black (10YR 2/1), nearly loose fine sand that contains a large amount of organic matter.
A_3 10 to 18 inches, dark-gray (10YR 4/1), loose fine sand.
C 18 to 48 inches, pale-brown (10YR 6/3), loose fine sand with common, medium, distinct mottles of pale yellow (2.5Y 7/4), yellow (10YR 7/8), and light gray (10YR 7/1).

Bog soils

The Bog soils have surface layers of mucky peat or muck underlain by peat or muck. They have formed under a marsh or swamp type of vegetation.

The Everglades, Brighton, and Pamlico soils are Bog soils. These soils occupy broad, level areas that are covered by water during many months of the year. Some areas have been reclaimed by installing drainage ditches with control structures. The reclaimed areas have been used for growing vegetables and other truck crops and for improved pastures.

EVERGLADES AND BRIGHTON SERIES

The Everglades and Brighton soils have surface layers of mucky peat that contains both decomposed organic matter and fibrous materials. The underlying organic materials are fibrous and felty, and they overlie sands, sandy loams, or clays.

The Everglades soils have formed from the remains of sedges, sawgrass, lilies, myrtle bushes, and grasses that overlie alkaline sands, clays, and marl. The Brighton soils have formed from the remains of lilies, bonnets, sedges, shrubs, grasses, and other plants that overlie acid sands and clays.

In Orange County both of these series consist of the following four phases, based on the thickness of the organic materials: Shallow phase, 12 to 36 inches thick; moderately deep phase, 36 to 60 inches thick; deep phase, 60 to 96 inches thick; and very deep phase, more than 96 inches thick. In some areas near Lake Apopka, Everglades mucky peat, very deep phase, contains about 232 inches of organic materials.

The following describes a profile of Everglades mucky peat, moderately deep phase, observed in a cultivated field about 1 mile southwest of Zellwood, near the NE. corner NW¼ sec. 33, T. 20 S., R. 27 E.:

1. 0 to 10 inches, black (10YR 2/1) mucky peat; contains a considerable amount of decomposed organic matter and a few fibers of organic materials; neutral.
2. 10 to 20 inches, dark reddish-brown (5YR 3/2) peat; contains fibrous materials; neutral.
3. 20 to 44 inches, brown (7.5YR 4/4) peat; contains fibrous and felty organic materials.
4. 44 to 54 inches, very dark gray (10YR 3/1), disintegrated peat; contains a small amount of fibrous materials; mildly alkaline.
5. 54 to 60 inches, grayish-brown (10YR 5/2) marl of clay loam texture.

In color the Brighton mucky peats are similar to the Everglades mucky peats. They differ chiefly in that they are strongly acid or very strongly acid instead of slightly acid or alkaline.

PAMLICO SERIES

Pamlico muck, a strongly acid to very strongly acid organic soil, has formed from the decomposed remains of lilies, sedges, shrubs, grasses, arrowhead, bay trees, and cypress trees mixed with a small amount of sand. The organic materials are more decomposed than those of the Brighton soils, and the soil contains more mineral matter. Commonly, the black mucky material is 12 to 60 inches thick, but in a few places it is about 96 inches thick. The underlying mineral soil grades from dark-colored to lighter colored sands with increasing depth.

Regosols

The Regosols consist of deep, soft mineral deposits or unconsolidated rock in which few or no clearly expressed soil characteristics have developed. The Regosols in Orange County have formed from deposits of loose, sandy materials. The Adamsville, Lakeland, Blanton, Eustis, Orlando, and St. Lucie soils are classified as Regosols.

ADAMSVILLE SERIES

The Adamsville soils are nearly level and are somewhat poorly drained. They occur in the eastern part of the county. These soils have formed in moderately thick deposits of sands that overlie alkaline clayey materials or marl. Besides Adamsville fine sand, a shallow phase and a dark colored surface phase of this soil type are mapped in Orange County.

The upper part of the profile is medium to slightly acid, and the deeper horizons are neutral or alkaline. In Adamsville fine sand, the sand extends to depths of more than 42 inches. The shallow phase has mottled gray, yellow, and pale-yellow fine sandy loam or fine sandy clay loam beginning at depths of 30 to 42 inches. The dark colored surface phase has a black or very dark gray surface layer, 9 to 15 inches thick, underlain by sandy horizons to depths of more than 42 inches.

The following describes a profile of Adamsville fine sand, observed in a forested area west of State Highway No. 520 (SW¼ sec. 21, T. 24 S., R. 34 E.):

A_1 0 to 5 inches, very dark gray (10YR 3/1), nearly loose fine sand; very weak, fine, granular structure to single grain (structureless); medium to slightly acid; salt-and-pepper appearance.
A_2 5 to 16 inches, light-gray (10YR 6/1), loose fine sand; single grain (structureless); slightly acid.
C_{11} 16 to 20 inches, brown (10YR 5/3), organic-stained, loose fine sand; slightly acid.
C_{12} 20 to 36 inches, light yellowish-brown (10YR 6/4), loose fine sand with a few, fine, distinct mottles of brownish yellow (10YR 6/8) and light gray (10YR 7/1); neutral.
C_{13} 36 to 48 inches, mottled light yellowish-brown (10YR 6/4), light-gray (10YR 6/1), and light olive-brown (2.5Y 5/4), loose fine sand; mildly alkaline.

LAKELAND, BLANTON, EUSTIS, AND ORLANDO SERIES

The Lakeland, Blanton, Eustis, and Orlando soils have formed in moderately thick or thick deposits of sand. All of these soils are strongly acid. They are level to strongly sloping. The slopes are dominantly less than 12 percent, but a few hundred acres of these soils have slopes of 13 to 17 percent. These soils are mainly well drained to somewhat excessively drained. Some of the Blanton soils are moderately well drained.

The following describes a profile of Lakeland fine sand, very gently sloping phase, observed in a forested area at the edge of a borrow pit. The area is about 1 mile northwest of Orlovista, near the SE. corner of NW¼NW¼ sec. 25, T. 22 S., R. 28 E.:

A_1 0 to 4 inches, dark grayish-brown (10YR 4/2), nearly loose fine sand; single grain (structureless).

A_3 4 to 8 inches, brown (10YR 5/3), loose fine sand; single grain (structureless).

C_{11} 8 to 48 inches, yellowish-brown (10YR 5/6), loose fine sand; single grain (structureless); lower part of horizon contains a few, fine streaks or featherings of light gray (10YR 7/2).

C_{12} 48 to 80 inches +, light yellowish-brown (10YR 6/4), loose fine sand that has streaks of light gray and brownish yellow; near the borrow pit, fine sandy clay loam mottled with yellow, yellowish brown, and light gray and containing a few streaks of red occurs at depths ranging from 60 to as much as 120 inches.

The surface layers of the Eustis and Blanton soils are dark gray to grayish brown and are 3 to 8 inches thick. The lower horizons of the Eustis soils are strong brown, reddish yellow, or yellowish red. The lower horizons of the Blanton soils are predominantly light gray, light brownish gray, very pale brown, and pale yellow or mottled pale yellow and light gray. High and low phases of the Blanton soils are mapped in this county. The high phases are well drained to somewhat excessively drained and occur adjacent to the Lakeland and Eustis soils. The low phases are on low ridges or knolls near to, or surrounded by, the Leon and Pomello soils. They are moderately well drained. The water table fluctuates; it is moderately shallow in wet seasons and very deep in dry seasons.

Orlando fine sands have a black to dark-gray surface layer that is as much as 18 inches thick. The lower horizons are pale brown, grayish brown, light gray, or yellowish brown.

The Lakeland, Eustis, Orlando, and deeper Blanton soils consist of fine sand to depths of 42 inches or more. The sandy materials may be 240 or more inches thick over nonconforming, fine-textured materials. The shallow Blanton fine sand is underlain, at depths of 30 to 42 inches, by mottled light-gray, pale-yellow, and yellowish-brown fine sandy clay loam or fine sandy clay. Where fine-textured materials are within 30 inches of the surface, the soil is designated as Esto fine sand, which is not mapped separately in the county. In some places the fine-textured materials are red, mottled with light gray and yellowish brown.

Blanton and Esto fine sands, gently sloping and sloping phases, has been mapped in the ridge areas in the western and northwestern parts of the county. Within short distances the depth to fine-textured materials ranges from less than 30 to more than 42 inches.

ST. LUCIE SERIES

The St. Lucie soils, represented in Orange County by St. Lucie fine sand, are strongly acid to very strongly acid. They have formed in thick deposits of sand. These soils are excessively drained. They have a very thin, gray or light-gray surface layer, 1 to 4 inches thick; this is underlain by white, loose, noncoherent fine sand that extends to a depth of 60 inches or more. In places, an organic-stained layer or an organic pan occurs several feet below this material.

General Nature of the Area

This section of the report tells something about the physiography, climate, vegetation, water supply, and early settlement of Orange County. It is primarily useful to those not familiar with the area.

Physiography, Relief, and Drainage

Physiographically, Orange County lies within the Floridian section of the Atlantic Coastal Plain (*3*). The eastern and southern parts of the county are considered by Cooke (*2*) to be included in the Coastal Lowlands, and the western part, to be in the Central Highlands.

The eastern and southern parts of the county are generally nearly level. There are a few, very gently sloping, low ridges, but over large areas the changes in elevation are so gradual as to be barely perceptible. The western and northwestern parts of the county are very gently sloping to rolling. Much of this part of the county has slopes of between 0 and 8 percent, but some areas near sinkholes have slopes of nearly 25 percent.

Elevations in the county range from about 15 feet above sea level, along the St. Johns River, to 150 feet, at Apopka. Other elevations in the county are as follows: Bithlo, about 70 feet above sea level; Christmas, 45 feet; Oakland, 123 feet; Ocoee, 127 feet; Orlando, 109 feet; Pine Castle, 103 feet; Plymouth, 122 feet; Taft, 97 feet; Union Park, 64 feet; Winter Garden, 119 feet; Winter Park, 93 feet; and Zellwood, 90 feet (*4*).

There are many intermittent ponds, swamps, and marshes, and a few permanent lakes in the nearly level plains, or flatwoods, in the eastern and southern parts of the county. Most of the areas are connected by sluggish streams or by wide, shallow sloughs. Those in the eastern part of the county drain into the Econlockhatchee River, or into Tootoosahatchee Creek, James Creek, Taylor Creek, and the other tributaries of the St. Johns River, which flows northward along the eastern boundary of the county. The flood plains of these streams are only a few feet below the adjoining uplands. The south-central part of the county drains into the canals and other tributaries of the Kissimmee River, which flows southward from the county into Lake Okeechobee.

The western and northwestern parts of the county contain many lakes and sinkholes but only a few continuous streams. Most of the drainage water seeps into the lakes. Rock Springs and Wekiwa Springs, in the northwestern part of the county, form the source of one branch of the Wekiwa River, a tributary of the St. Johns River. Lake Apopka, which lies along the western boundary of the county, drains into a branch of the Ocklawaha River, also a tributary of the St. Johns River.

Many small tracts throughout the county have been reclaimed by constructing drainage canals and ditches. The most extensive projects have been the reclamation of the organic soils north of Lake Apopka and near Lake Hart.

Climate

The climate of Orange County is subtropical. The temperatures are modified greatly, however, by winds that sweep across the peninsula from the Atlantic Ocean and the Gulf of Mexico. The summers are long, warm, and humid, but thundershowers that occur almost every afternoon prevent temperatures from becoming extremely high. Winters are short and mild; many of the days are bright and sunny, and there is little precipitation. Cold spells, accompanied by cold winds, can be expected only a few times during the year, and they last only a few days. Occasionally, thin ice forms. Generally, the cold spells are preceded by rain.

Data on climate for Orange County are given in table 5. This information was compiled from records taken at the United States Weather Bureau Station at the Orlando Municipal Airport.

TABLE 5.—*Temperature and precipitation at Orlando Municipal Airport, Orange County, Florida*

[Elevation, 106 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1927)	Wettest year (1905)	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	62.7	87	24	2.09	1.29	8.43	0
January	61.9	87	26	2.05	.11	.41	[3]
February	63.2	89	28	2.05	1.71	2.12	0
Winter	62.6	89	24	6.19	3.11	10.96	[3]
March	66.7	92	31	3.26	2.30	5.13	0
April	71.6	96	39	2.96	.62	1.71	0
May	76.5	102	49	4.02	.47	8.12	0
Spring	71.6	102	31	10.24	3.39	14.96	0
June	80.8	100	60	7.85	3.84	8.13	0
July	82.1	99	66	7.70	9.03	6.15	0
August	82.4	99	64	6.87	5.71	17.13	0
Summer	81.8	100	60	22.42	18.58	31.41	0
September	80.7	97	56	7.15	4.13	13.11	0
October	74.7	94	43	3.91	3.89	3.42	0
November	66.8	89	29	1.32	.74	.33	0
Fall	74.1	97	29	12.38	8.76	16.86	0
Year	72.5	102	24	51.23	33.84	74.19	[3]

[1] Average temperature based on a 64-year record, through 1955; highest and lowest temperatures based on a 16-year record, through 1958.

[2] Average precipitation based on a 64-year record, through 1955; wettest and driest years based on a 59-year record, in the period 1900–1958; snowfall based on a 16-year record, through 1958.

[3] Trace.

The average annual temperature is 72.5° F. The average temperature in winter is 62.6°, and that in summer is 81.8°. Temperatures rarely exceed 95°, but a reading of 102°, has been recorded. Killing frosts have occurred as late as March 23 and as early as November 10. The average frost-free season lasts for 314 days, or from February 3 to December 14 (7). The lowest temperature recorded in Orlando was 24°, but a reading of 19° was recorded in Zellwood in February 1947. Usually, the temperature drops to below freezing only during the few hours before dawn.

Many kinds of vegetables can be grown during fall and winter, but tender vegetables and some fruits may be damaged by frosts that occur about every other year. As the result of differences in elevation, temperatures vary a few degrees in places that are not far apart. Sometimes cold air settles in depressions or in flat areas and damages or kills citrus trees or other crops. In the winter of 1894–95 most of the citrus trees were killed by a severe frost.

Cattle and other animals graze on the native and improved pastures throughout the year. It is not necessary to build shelters for livestock if vegetative shelter areas are available.

Rainfall is fairly abundant. The rainy season extends from June through September. During that period approximately 60 percent of the precipitation falls. During the rest of the year, the rainfall is distributed fairly uniformly. Most of the precipitation falls in summer during afternoon thunderstorms. These occur on about 50 percent of the days and generally last for only 1 or 2 hours. Moderately high winds, which occasionally accompany the thunderstorms, occur locally for short periods.

Between August and November, tropical storms sometimes sweep across the county. Most of these develop over the Caribbean Sea near the West Indies. The heavy rainfall that accompanies such storms is generally more damaging to crops than the wind, but the wind may destroy buildings, tall vegetation, and the fruit on citrus trees. Usually, the damage is confined to a storm path that is between 40 and 75 miles wide.

Vegetation

As a result of the merging of subtropical and warm-temperate climates in this area, many kinds of plants grow in Orange County. Differences in natural drainage and in soil characteristics also affect the kinds of plants growing here. Many types of vegetation are associated with a particular kind of soil.

Originally, much of the county was covered by a dense stand of pine. Most of the original trees, except those in some of the fresh-water swamps, have been cut. Subsequent stands of trees, mostly of small size, have also been cut in some areas, either for lumber or to clear the soils for crops and pasture.

Longleaf pine, a few shrubs, and grasses originally grew on the somewhat excessively drained and well-drained, deep, sandy soils. After the pine trees were removed, turkey and bluejack oaks and a few longleaf pines became established on these soils. Live oaks grew on some of the wetter areas. Much of the acreage that has been cleared is used for improved pasture or to grow citrus trees.

A scrubby vegetation consisting of scrub live oak, sand pine, rosemary, and a few turkey and bluejack oaks, saw-palmettos, and grasses grow on the excessively drained, deep, sandy soils.

In much of the eastern and southern parts of the county are nearly level soils that are somewhat poorly drained, poorly drained, and very poorly drained. These areas are commonly called flatwoods. The vegetation consists dominantly of pine, saw-palmetto, gallberry, runner oak, huckleberry, and wiregrass. In addition to these plants, there are cabbage palmetto, live oak, myrtle bushes, and vines in the areas near the St. Johns River that contain alkaline soil materials. Large areas of the flatwoods have been cleared and seeded to improved pastures or used to grow vegetables and other truck crops.

Many ponds and shallow lakes contain, or are surrounded by, short grasses, sedges, lilies, bonnets, and other aquatic plants. Sedges, sawgrass, reeds, grasses, and a few shrubs once grew in the large marsh north of Lake Apopka. Much of this area has been reclaimed by draining and then irrigating the soil, and it is used to grow vegetables and other truck crops.

The swamps in the interior of the county contain a mixture of trees and shrubs including cypress, gum, elm, hickory, magnolia, live and water oaks, maple, cabbage palmetto, and various kinds of vines, shrubs, and grasses. Some areas contain trees of a size and quality suitable for lumber.

Water Supply

The many ponds, lakes, streams, irrigation ditches, and underground reservoirs in all parts of Orange County furnish an ample supply of water for use on the farms and in the towns. In the eastern and southern parts of the county, there is enough surface water to meet most of the requirements during the greater part of the year. Many lakes and streams dry up for a few months of the year, but supplemental water is obtained from wells. Water is pumped from the wells by using electric or gasoline motors or by using windmills. A few rural homes have cisterns to collect water for use on the farm. Most farm homes are equipped with running water.

Effective irrigation systems operate in highly developed vegetable fields, in the citrus groves, and in some of the improved pastures. On vegetable crops and in improved pastures, the irrigation water commonly is released through shallow, narrow ditches spaced at calculated intervals. The water seeps through the soil and raises the water table to the level desired.

In areas of organic soils near Zellwood and Lake Hart, the level of the water table is controlled through the use of water-control structures that are placed in the canals. Small acreages of improved pastures and citrus groves are irrigated by pumping water through portable pipelines that are perforated or through revolving sprinklers.

Careful control of water is essential if the soils are to be used effectively. The agricultural potential of some of the soils may be increased greatly through proper drainage and irrigation.

Early Settlement

The first settlers in the area that is now Orange County came chiefly from other parts of Florida and from neighboring States, mainly Georgia. Many people also migrated to the county from the northern States. These traveled by boat up the St. Johns River and then continued overland by wagon. Almost all of the early settlers were born in the United States and were of English descent.

Organization and Population

What is now Orange County was formed in 1824 under the name of Mosquito County. In 1845 the name of the county was changed to Orange County because of the prevalence of orange trees. Orlando, the county seat, was named in honor of Orlando Reeves, one of the early settlers.

The population of the county has increased greatly in recent years. In 1920 the population was 19,890 as compared to 114,950 in 1950. During the same period the population of Orlando rose from 9,282 to 52,367. In 1950 the populations of other towns in the county were as follows: Winter Park, 8,250; Winter Garden, 3,503; Conway, 990; Apopka, 2,254; Pine Castle, 2,000; and Zellwood, 1,800.

Industries

Many industries are located in Orlando and in other communities in Orange County. These employed about 59,000 workers in 1955. They include canning and quick-freezing plants for citrus fruits and vegetables, bottling plants, nurseries, and slaughterhouses for beef cattle and hogs. In other plants are produced cans and other containers, fertilizer, livestock and poultry feed, windows, trailers, boats, furniture, mattresses, concrete blocks, batteries, ornamental ironwork, bottled gas, electronics equipment, plastic products, paints and lacquers, and prefabricated houses.

Transportation and Markets

The more densely populated western half of Orange County has better transportation facilities than the eastern half, which is sparsely populated. A number of branches of the Atlantic Coast Line Railroad and the Seaboard Air Line Railroad extend across the western part of the county. In the eastern part and in the southwestern corner of the county, some communities are many miles from a rail terminal.

United States Highways Nos. 17, 92, and 441 pass through Orlando and the western part of the county. In addition, several State Highways and other paved roads serve the county. The graded roads are maintained fairly well and are passable throughout the year. Bus transportation is available in the larger communities.

Several commercial airlines provide transportation to and from Orlando. The Pinecastle Air Base is located a few miles south of that city.

Many people own small pleasure boats. Fishing is a popular sport on the St. Johns River and on the many lakes.

Orlando and the adjacent communities use only a small part of the vegetables and other truck crops, citrus fruits, and beef produced in the county. Most of the agricultural products are transported by truck or rail to other markets within or outside the State. Nearly all of the products are loaded from packinghouses, which are located near a railroad or paved road. Some sweet corn

and celery, however, is loaded on trucks from the harvesting machines in the field. These machines wash, grade, and package the sweet corn and celery. Most of the cattle and hogs to be marketed are loaded in trucks at the farms or ranches.

Community Facilities

There are schools and churches throughout Orange County. Most of the children in rural areas are transported by bus to and from public schools in the larger communities. Other educational institutions include Rollins College, located in Winter Park, and a junior college, an academy of music, a vocational school, business colleges, and private schools, located in Orlando. A public library and four branches are in Orlando, and a "bookmobile" serves rural residents.

Six general hospitals, a State tuberculosis sanatorium, and a convalescent home are located in the county. Mobile units of the county health clinic provide medical treatment throughout the county.

Rural mail delivery serves all parts of the county. Most communities have fire departments with either paid or volunteer firemen.

A total of 1,577 farms had telephones, 2,251 farms had electricity, and 2,175 farms had piped running water, according to the 1954 Federal census.

Agriculture

The agriculture of Orange County is based mainly on the production of citrus fruits, vegetables and other truck crops, nursery and greenhouse plants, dairy products, beef cattle, poultry and eggs, and forest products. The statistics used are taken from reports published by the United States Bureau of the Census.

Agricultural History

The early agriculture in Orange County consisted mainly of the growing of crops for home use. The pioneers grew corn, potatoes, and other crops, mainly on the better drained areas. Many of the settlers planted a few orange trees around their houses. Most of them raised some livestock, including a few milk cows and hogs. Transportation facilities were lacking, and, as a result, agriculture developed slowly. Nevertheless, the number of livestock increased steadily because large acreages of open range furnished fair grazing.

During the 1870's, citrus trees were planted for commercial use. Although the citrus groves were damaged by frost in 1885, 1894, and 1895, the acreage of trees and the production of fruit increased steadily.

Truck crops became important after transportation facilities were improved. These crops were first grown around Winter Garden and near Lake Apopka during fall and spring. Some vegetables were also grown near Lake Hart.

Corn has been grown continuously since the county was settled. Until 1918 corn and cotton were the principal field crops. The corn was grown for home use, and some of it was fed to livestock. Because of a decline in the price of cotton, the acreage of this crop decreased from 2,000 acres in 1918 to 40 acres in 1919. Cotton is no longer grown commercially.

Land Use

The proportion of land in farms in Orange County has increased greatly in recent years. In 1930, only 102,347 acres, or 17.2 percent of the total acreage, consisted of land in farms. By 1954, 434,199 acres, or 74.1 percent of the total acreage, was in farms. During the same period the number of farms increased from 1,608 to 2,726, and the average size of farms, from 63.6 to 159.3 acres.

The following list shows how land in farms was used in 1954:

	Acres
Cropland harvested	93,151
Cropland used only for pasture	26,017
Cropland not harvested and not pastured	13,255
Woodland pastured	163,544
Woodland not pastured	34,853
Other pasture (not cropland and not woodland)	62,097
Other land (house lots, roads, wasteland, etc.)	41,282
Cropland, total	132,423
Land pastured, total	251,658
Woodland, total	198,397

Types and Sizes of Farms

About 36 percent of the farms in Orange County were miscellaneous and unclassified in 1954. Other farms were listed by type as follows:

	Number
Fruit and nut	1,496
Vegetable	30
Dairy	42
Poultry	60
Livestock other than dairy and poultry	66

In 1954 the farms ranged in size from less than 3 acres to 1,000 or more acres. A total of 838 of the farms were less than 10 acres in size; 886 farms were between 10 and 29 acres; 312 farms were between 30 and 49 acres; 376 farms were between 50 and 139 acres; 120 farms were between 140 and 259 acres; 79 farms were between 260 and 499 acres; 61 farms were between 500 and 999 acres; and 54 farms were 1,000 acres or more. Many of the small farms are along or are close to the main highways near Orlando and the other towns.

Crops

Citrus crops, vegetables and other truck crops, and nursery and greenhouse products are an important source of income in Orange County. The acreages of these and other crops are given in table 6 for stated years.

Oranges are the main citrus fruits grown in the county, but many grapefruits and tangerines are also produced. Small acreages are planted to grapevines and to lemon, lime, avocado, lychee, peach, pear, and pecan trees. The citrus groves are mostly on the Lakeland, Blanton, Eustis, Orlando, and Scranton soils, which are slightly higher and better drained than surrounding soils. These are mainly in the western and northwestern parts of the county. Some of the groves extend into strips or small areas of the adjoining Ona, Leon, Immokalee, and Pomello soils. During the winter

TABLE 6.—*Acreage of principal crops and number of fruit trees, nut trees, and grapevines of bearing age*

[Lack of an acreage figure indicates that information is not available or that acreage figures were not reported for the specified crop]

Crop	1929	1939	1949	1954
Corn:	*Acres*	*Acres*	*Acres*	*Acres*
For all purposes	968	612	271	261
Harvested for grain	640	165	133	44
Nursery and greenhouse products	----------	312	582	1, 458
Peanuts for all purposes, grown alone	3	63	29	8
Hay	[1] 548	[1] 242	[2] 144	[2] 1, 849
Vegetables and truck crops:				
Cabbage	353	290	295	249
Celery	42	----------	627	120
Cucumbers and pickles	744	66	253	100
Eggplant	----------	1	45	1
Endive and escarole	10	13	429	535
Lettuce and romaine	159	13	170	118
Okra	1	6	9	15
Potatoes, Irish	38	19	[3] 18	[4] 3
Radishes	----------	----------	36	5, 747
Snapbeans (pole and other types)	109	49	579	749
Squash	1	5	19	95
Sweet corn	26	84	1, 792	1, 376
Sweet peppers and pimientos	32	283	325	52
Sweetpotatoes	130	39	[3] 19	[4] 17
Tomatoes	74	32	41	27
Turnips	1	6	6	92
Watermelons	228	17	170	529
Fruit and nut trees:	*Number* [5]	*Number* [5]	*Number* [5]	*Number* [5]
Avocado	1, 071	65	84	326
Grapefruit	138, 585	431, 631	330, 173	479, 670
Lemon	715	734	2, 707	1, 965
Orange	1, 070, 456	2, 138, 466	2, 545, 712	3, 650, 168
Peach	2, 177	160	89	587
Pear	69	44	178	263
Tangerine and mandarin	113, 276	209, 662	207, 069	218, 662
Pecan	602	405	352	269
Grapevines	13, 664	16, 936	99	136

[1] Does not include sorghum hay.
[2] Does not include cowpeas and peanuts grown for hay.
[3] Does not include acreage for farms with less than 15 bushels harvested.
[4] Does not include acreage for farms with less than 20 bushels harvested.
[5] Number in the census year, which is 1 year later than the crop year given at the head of the column.

of 1957–58, the citrus crop was damaged when cold air settled in areas that had poor air drainage.

Vegetables and other truck crops are grown on about 8,000 to 11,000 acres and are harvested late in fall, in winter, and in spring. Only lettuce, escarole, endive, cabbage, celery, radishes, and other crops that tolerate cold are grown during winter. The vegetables are grown on small areas of somewhat poorly drained soils and poorly drained soils near Winter Garden and other communities in the east-central part of the county. About 7,820 acres of Everglades mucky peats, near Zellwood and Plymouth, are farmed intensively. Usually, two or more crops are produced on the same field during a cropping season; sometimes five or six crops of radishes, which grow to maturity in 21 to 28 days, are grown on the same field. When the price is favorable, the radishes are harvested by machinery and sold. If the price is too low, the crop may be turned under and the field replanted to radishes.

Sweet corn has increased in importance since 1939. Most of the crop is grown on the Everglades mucky peats near Zellwood and Plymouth. It is harvested late in April and in May. Some of the crop is marketed locally, and the rest is shipped outside the State.

Many ornamentals, foliage plants, and citrus nursery stocks are grown in the more than 400 nurseries located principally near Apopka, Orlando, and the other communities in the western part of the county. Several of the nurseries have slathouses and saranhouses that furnish some shade for growing plants (fig. 10). Gladiolus and caladium bulbs are grown on the organic soils.

Field corn is grown on a few farms (fig. 11). More than half of the crop is made into silage. The silage is fed mostly to dairy cows, but a small part is fed to beef cattle. Some of the crop is allowed to mature and is harvested as feed for horses, hogs, poultry, and dairy cows and calves. Most of the corn is grown on

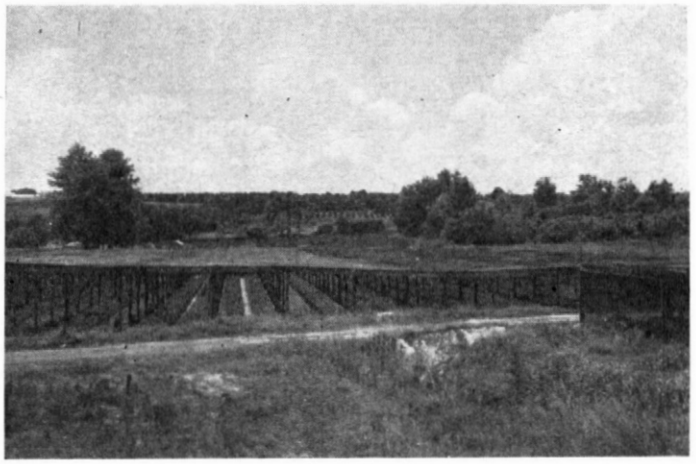

***Figure 10.*—Slathouses provide cover and partial shade for ornamental plants on the very gently sloping and gently sloping Lakeland and Blanton soils.**

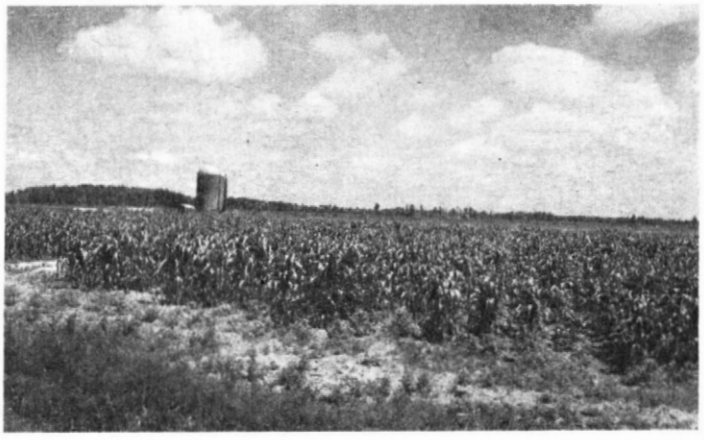

***Figure 11.*—Stand of corn on Leon fine sand.**

the somewhat poorly drained soils and on areas of poorly drained soils that have artificial drainage. The yields vary, but during recent years they have increased considerably. Under good management, between 50 and 60 bushels per acre are obtained from some of the hybrid varieties.

Sugarcane is grown for sirup on a few acres, and Sea Island cotton is grown on a small acreage. Irish potatoes are grown mainly for home use. Most of the sweetpotatoes are raised for home use, but some are sold within the State.

Pastures

A large acreage of unimproved and improved pastures in Orange County provides grazing for livestock. The native vegetation on the pastures that are unimproved furnishes poor to fair forage. The acreage in improved pastures has increased recently. In 1956, when fieldwork for the soil survey of this county was being done, there was more than 38,450 acres of improved pasture in the county. Most of the unimproved pastures were on the somewhat poorly drained and poorly drained soils in the eastern and southern parts of the county. About 55 percent of the acreage consisted of Leon soils.

Pangolagrass, Pensacola bahiagrass, common bahiagrass, bermudagrass, white clover, Hubam clover, and hairy indigo are the principal plants in improved pastures. Some of the areas have been improved through artificial drainage. Subirrigation and sprinkler irrigation are used on grass-and-clover pastures. The Lakeland and Eustis soils and some areas of the Blanton soils are somewhat droughty for the growing of improved pasture grasses.

Large acreages of improved pastures near Orlando supply much of the feed for dairy herds. Some of the forage is chopped in the field, hauled to the milking barns, and fed to the cows. Other improved pastures are grazed mostly by beef cattle.

Livestock and Livestock Products

The number of livestock on farms in Orange County in stated years is shown in table 7. The number of cattle and calves has increased greatly since 1930.

The improvement of pastures is largely responsible for the increase in the number, kind, and quality of the animals raised in the county. Most of the beef cattle come from grade cows and purebred Brahman, Hereford, Aberdeen-Angus, and Shorthorn sires. There are a few purebred herds of Brahman, Hereford, and Aberdeen-Angus cattle.

Much of the milk is used locally. There are several large dairies near Orlando and other communities. Most of the dairy cattle are good grades of Holstein-Friesian, Guernsey, and Jersey, but there are some purebred herds of these breeds. The large dairies have purebred sires or use artificial insemination with semen from proven sires. On many small farms there are only one or two milk cows.

On most farms a small flock of chickens is kept for egg production; some farmers also raise broilers. White Leghorn, Barred Plymouth Rock, New Hampshire Red, and Rhode Island Red are the common breeds. Several farmers keep small flocks of turkeys.

TABLE 7.—*Number of livestock on farms*

Livestock	1930	1940	1950	1954
	Number	*Number*	*Number*	*Number*
Cattle and calves	7, 782	[1] 7, 531	21, 947	35, 279
Milk cows	1, 357	2, 175	4, 028	5, 663
Horses and colts	379	[1] 216	583	494
Mules and mule colts	489	[1] 125	68	27
Hogs and pigs	2, 167	1, 777	2, 963	2, 271
Chickens	[1] 53, 537	[2] 40, 095	[2] 77, 108	[2] 71, 005
Turkeys raised	[3] 1, 211	[3] 1, 002	[3] 3, 744	8, 584
Ducks raised	[3] 2, 839	[3] 1, 012	[3] 1, 073	1, 264

[1] Over 3 months old.
[2] Over 4 months old.
[3] In year preceding census year.

Duroc-Jersey, Hampshire, and Poland China are the main breeds of hogs in the county. There are a few purebred herds; many of the grade herds have purebred sires. Many of the hogs are fed sterilized garbage and sour milk, and others graze the native vegetation.

In 1954 the sale of livestock and livestock products provided a fairly large source of cash income. Total products sold included 3,545,543 gallons of whole milk, 75 pounds of butterfat, 709,416 dozen eggs, 142,187 chickens, 15,718 cattle and calves, and 1,467 hogs and pigs.

Farm Tenure

Most of the farms in Orange County are operated by owners. In 1954, owners operated 2,529 farms, which contained 225,511 acres; part owners, 69 farms, totaling 136,486 acres; managers, 78 farms, totaling 68,291 acres; and tenants, 50 farms, totaling 3,911 acres.

On the 1,495 farms reporting in 1954, there were 3,697 workers, including family members and hired help, during the last week of September. There were 1,836 hired workers employed on 449 farms reporting; of these 594 were seasonal workers. Some transient laborers helped harvest the fruits and vegetables.

Many owners of farms live in Orlando or other communities. Caretakers, managers, or laborers may live on or near the farm. Some citrus groves are leased and operated by companies that process citrus fruits.

Many part-time farmers who live along the main highways and other roads have a small acreage of citrus trees and truck crops and raise some poultry. They work in Orlando or nearby towns for their main source of income.

Farm Power and Mechanical Equipment

Tractors provide the main source of power in cultivating, fertilizing, and harvesting crops. In 1954, there were 1,159 tractors on the 723 farms reporting. Most of the tractors were of the 2-row type. About 54 crawler-type tractors were being used on the larger farms and ranches.

A total of 494 horses and 27 mules were reported on 223 farms. Many of the horses are used to tend herds

of cattle, but others furnish the source of power in small fields.

Mechanical equipment reported on farms in 1954 included 15 field forage harvesters; 18 pickup hay balers; 11 cornpickers; 8 grain combines. In addition, there were many disk harrows; dusting and spraying equipment for fruit trees and vegetables (fig. 12); crop harvesters for radishes, sweet corn, and celery; mowers; and irrigation equipment. Some of the larger producers and cooperatives have power-driven machinery for washing and grading citrus fruits and vegetables.

Figure 12.—**Spraying operation protects celery grown on this field of Everglades mucky peat. A fungicide is being used.**

A total of 1,253 motortrucks was reported on 778 farms and 2,800 automobiles, on 1,865 farms. The trucks are used to haul seed, fertilizer, implements, and workers to the field and to transport harvested crops to market.

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GUIDE TO MAPPING UNITS

Map symbol	Soil	Described on page—	Capability unit	Described on page—
Aa	Adamsville fine sand	7	IVsw–2	41
Ac	Adamsville fine sand, dark colored surface phase.	8	IVsw–2	41
Ab	Adamsville fine sand, shallow phase.	8	IVsw–2	41
Ad	Alluvial land	8	(1)	
Ba	Blanton fine sand, level high phase.	8	IIIse–1	38
Bc	Blanton fine sand, very gently sloping high phase.	9	IIIse–1	38
Be	Blanton fine sand, gently sloping high phase.	9	IVse–1	41
Bf	Blanton fine sand, sloping high phase.	9	VIse–1	43
Bb	Blanton fine sand, level low phase.	9	IIIse–2	39
Bd	Blanton fine sand, very gently sloping low phase.	10	IIIse–2	39
Bg	Blanton fine sand, level shallow low phase.	10	IIIse–2	39
Bh	Blanton and Esto fine sands, gently sloping and sloping phases.	10	VIse–1	43
Bp	Borrow pits	11	(1)	
Bj	Brighton mucky peat, shallow phase.	11	IIIws–4	37
Bk	Brighton mucky peat, moderately deep phase.	11	IIIws–4	37
Bl	Brighton mucky peat, deep phase.	12	IIIws–4	37
Bm	Brighton mucky peat, very deep phase.	12	IIIws–4	37
Ca	Charlotte fine sand	12	IVws–2	40
Da	Delray fine sand	13	IIIws–2	36
Db	Delray fine sand, shallow phase	13	IIIws–2	36
Dc	Delray mucky fine sand	14	IIIws–2	36
Ea	Eustis fine sand, level phase	14	IIIse–1	38
Eb	Eustis fine sand, very gently sloping phase.	14	IIIse–1	38
Ec	Everglades mucky peat, shallow phase.	14	IIIws–4	37
Ed	Everglades mucky peat, moderately deep phase.	15	IIIws–4	37
Ee	Everglades mucky peat, deep phase.	16	IIIws–4	37
Ef	Everglades mucky peat, very deep phase.	16	IIIws–4	37
Fa	Felda fine sand	16	IIIws–3	36
Fs	Fresh water swamp	17	(1)	
Ia	Immokalee fine sand	17	IVsw–1	40
Ka	Keri and Parkwood fine sands	18	Vws–2	42
La	Lakeland fine sand, level phase	19	IIIse–1	38
Lb	Lakeland fine sand, very gently sloping phase.	19	IIIse–1	38
Lc	Lakeland fine sand, gently sloping phase.	20	IVse–1	41
Ld	Lakeland fine sand, sloping phase.	20	VIse–1	43
Le	Lakeland fine sand, strongly sloping phase.	20	VIse–1	43
Lf	Leon fine sand	21	IVsw–1	40
Lg	Leon fine sand, level heavy substratum phase.	22	IIIsw–1	37
Lh	Leon fine sand, very gently sloping heavy substratum phase.	22	IIIsw–1	37
Ml	Made land	22	(1)	
Ma	Manatee fine sandy loam	22	IIIws–3	36
Mb	Manatee fine sandy clay loam	23	Vws–1	42
Mc	Manatee and Delray soils, overflow phases.	23	Vws–1	42
Oa	Ona fine sand	24	IIsw–1	35
Ob	Orlando fine sand, level phase	25	IIIse–2	39
Oc	Orlando fine sand, very gently sloping phase.	25	IIIse–2	39
Pa	Pamlico muck	26	IIIws–4	37
Pb	Plummer fine sand	26	IVws–1	39
Pc	Pomello fine sand	27	Vsw–1	42
Pd	Pompano fine sand	28	IVws–2	40
Pe	Pompano fine sand, shallow phase.	28	IVws–2	40
Pf	Pompano fine sand, overflow phase.	29	IVws–2	40
Ra	Rutlege fine sand	29	IIIws–1	35
Rb	Rutlege fine sand, shallow phase.	30	IIIws–1	35
Rc	Rutlege mucky fine sand	30	IIIws–1	35
Sa	St. Johns fine sand	30	IIIsw–1	37
Sb	St. Lucie fine sand	31	VIIs–1	43
Sc	Scranton fine sand	31	IIsw–1	35

[1] Miscellaneous land type, not classified in a capability unit.

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GENERAL SOIL MAP
ORANGE COUNTY, FLORIDA

1 Excessively drained soils: St. Lucie-Pomello-Blanton

2 Somewhat excessively drained to moderately well drained soils: Lakeland-Eustis-Blanton-Orlando

3 Somewhat poorly drained soils: Leon-Immokalee-Pomello-St. Johns

4 Somewhat poorly drained to poorly drained soils: Adamsville-Pompano-Delray

5 Poorly drained to very poorly drained soils: Rutlege-Plummer-Fresh water swamp

6 Very poorly drained organic soils: Everglades-Brighton-Pamlico

7 Very poorly drained soils, overflow areas: Manatee-Delray

1 0 1 2 3 4 Miles

N

LAKE COUNTY
SEMINOLE COUNTY
VOLUSIA COUNTY
OSCEOLA COUNTY
BREVARD COUNTY
LAKE APOPKA
Lake Beauclair
Tangerine
Lake Ola
Zellwood
Plymouth
Apopka
Rock Springs Run
Wekiwa River
Lake Maitland
Winter Park
ORLANDO
Clarcona
Fullers
Winter Garden
Oakland
Killarney
Ocoee
Minorville
Gotha
Orlovista
Johns Lake
Lake Butler
Doctor Phillips
Big Sand Lake
Pine Castle
Lake Conway
Taft
Lake Hart
Lake Mary Jane
Bithlo
New Christmas
Econlockhatchee River
Tootoosahatchee Creek
Green Branch
Second Creek
James Creek
Boggy Creek
Reedy Creek
St. Johns River
SEABOARD AIR LINE
COAST LINE
ATLANTIC COAST LINE
T. 20 S.
T. 21 S.
T. 22 S.
T. 23 S.
T. 24 S.
R. 27 E.
R. 28 E.
R. 29 E.
R. 30 E.
R. 31 E.
R. 32 E.
R. 33 E.
R. 34 E.
28°45′
28°30′
81°30′
81°15′
81°00′

INDEX TO MAP SHEETS

ORANGE COUNTY, FLORIDA

1 0 1 2 3 4 Miles

N

LAKE COUNTY

SEMINOLE COUNTY

VOLUSIA COUNTY

OSCEOLA COUNTY

LAKE APOPKA

Lake Beau clair

Lake Ola

Tangerine

Zellwood

Plymouth

Apopka

Rock River

Run

Wekiwa

SEABOARD AIR LINE

COAST LINE

ATLANTIC COAST LINE

Lake Maitland

Winter Park

Clarcona

Fullers

Winter Garden

Oakland

Killarney

Ocoee

Minorville

Gotha

Orlovista

ORLANDO

Johns Lake

Lake Butler

Doctor Phillips

Big Sand Lake

Fine Castle

Lake Conway

Taft

Bithlo

Christmas

Econlockhatchee River

New Creek

Tootoosahatchee Creek

Green Branch

Second Creek

James Creek

Bonny Creek

Reedy Creek

Lake Hart

Lake Mary Jane

Inset, sheet 16

28°45′

28°30′

81°30′

81°15′

81°00′

T. 20 S.

T. 21 S.

T. 22 S.

T. 23 S.

T. 24 S.

R. 27 E.

R. 28 E.

R. 29 E.

R. 30 E.

R. 31 E.

R. 32 E.

R. 33 E.

R. 34 E.

SOILS LEGEND

SYMBOL	NAME
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Sb	St. Lucie fine sand
Sc	Scranton fine sand

Soils surveyed 1952-57 by Ralph G. Leighty, D. T. Brewer, and W. R. Smith, Florida Agricultural Experiment Station, and O. E. Cruz, E. H. Evenson, F. Matanzo, D. S. Taylor, R. M. Craig, W. G. Diamond, E. D. Matthews, M. S. Morgan, and H. O White, Soil Conservation Service. Correlation by A. H. Hasty, Soil Conservation Service.

Soil Map constructed 1958 by Cartographic Division, Soil Conservation Service, USDA, from 1954 aerial photographs. Controlled mosaic based on Florida plane coordinate system, west zone, transverse Mercator projection, 1927 North American datum.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads
- Good motor
- Poor motor
- Trail
- Marker, U. S. (33)

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mine and Quarry
- Shaft
- Dump
- Prospect
- Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Oil well

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- Township, U. S.
- Section line, corner
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.
- Channel indefinite

Canals and ditches (CANAL / DITCH)

Lakes and ponds
- Perennial
- Intermittent

Wells (flowing)

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil type outline and symbol (Dx)
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land

Erosion
- Uneroded spot — U
- Sheet, moderate — S
- Sheet, severe — SS
- Gully, moderate — G
- Gully, severe — GG
- Sheet and gully, moderate — SG
- Wind, moderate
- Wind, severe
- Blowout
- Wind hummock
- Overblown soil

Gullies

Areas of alkali and salts
- Strong — A
- Moderate — M
- Slight — S
- Free of toxic effect — F
- Sample location — ● 26
- Saline spot — +

ORANGE COUNTY, FLORIDA

R. 27 E.

LAKE COUNTY

T. 20 S.

LAKE COUNTY

(Sheet 2)

(Sheet 5)

N

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1954.

Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

(Sheet 6)

R. 27 E. | R. 28 E.

10

N

T. 21 S.

Plymouth

Lake Standish

Lake Alden

Lake Hiawatha

Holts Lake

Lake Ida

Clear Water Lake

Marshall Lake

Lake Fuller

Lake Semmes

LAKE APOPKA

SEABOARD AIR LINE

D I S T R I C T 2

(Sheet 9)

(Sheet 11)

(Sheet 12)

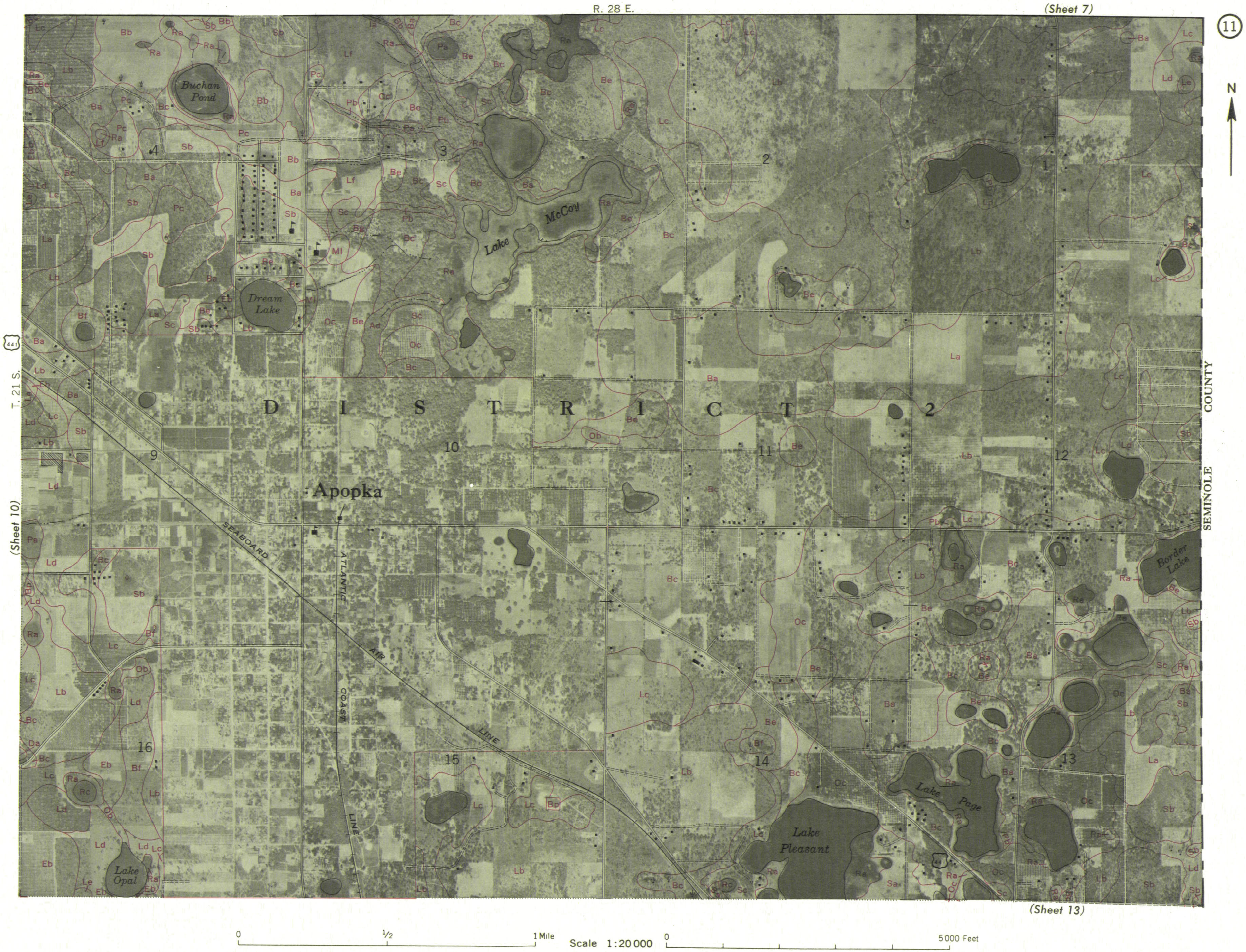
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

Range, township, and section corners shown on this map are indefinite.

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in1954



Scale 1:20000

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Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

R. 27 E. | R. 28 E.

(Sheet 10)

12

N

T. 21 S.

D I S T R I C T 2

L A K E

A P O P K A

Lake Sommers

Lake Maitland

Lake Marien

23 24 19 20 30 29 31 32

(Sheet 13)

(Sheet 16)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

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Range, township, and section corners shown on this map are indefinite.

(14)

R. 29 E.

N

SEMINOLE COUNTY

T. 21 S.

Piedmont

ATLANTIC COAST LINE

SEABOARD AIR LINE

Lake Lockhart

Lockhart

Lake Davis

Lake Lovely

Lake Shadow

Lake Weston

Lake Lucien

Harvest Lake

Long Lake

DISTRICT 2

30 29 28 27

31 32 33 34

(Sheet 13)

(Sheet 15)

(Sheet 18)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 29 E. R. 30 E.

15

N

T. 21 S.

(Sheet 14)

SEMINOLE COUNTY

Lake Hope

Lake Faith

Seminary Lake

Lake Charity

Lake Minnehaha

Lake Lucien

Lake Sybelia

POST OFFICE

ATLANTIC COAST LINE

Lake Maitland

DISTRICT 5

LAKE MAITLAND

Isle of Sicily

GLEN HAVEN MEMORIAL PARK CEMETERY

Eatonville

Park Lake

Lake Bell

Lake Gem

Lake Wilbur

Winter Park

SEMINOLE COUNTY

(Sheet 19)

26 25 30 29 35 36 31 32

Ra Sb Ba Oc Bc Ml Sc Lf Pc Fs Bb Pb Rc Be Bp Pa

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(16)

(Sheet 12)

N

R. 27 E. | R. 28 E.

T. 22 S.

(Sheet 16)

(Sheet 26)

(Sheet 17)

(Inset)

(Sheet 26) | (Sheet 27)

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 28 E.

(Sheet 13)

17

N

T. 22 S.

(Sheet 16)

(Sheet 18)

(Sheet 28)

DISTRICT 2

DISTRICT 3

ATLANTIC COAST LINE

ATLANTIC COAST LINE

Lake Addah

Lake Arlie

Lake Meadow

Lake Sidney

Prairie Lake

Crooked Lake

Lake Sanchez

Lake Sparkling

Horseshoe Lake

Lake Tiny

Lake Genie

Lake Barlow

Lake Stanley

Lake Small

Spring Lake

Lake Johio

Lake Lucy

Lake Florence

Lake Olympia

CENTRAL FLORIDA HOSPITAL

RADIO STATION

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

(18)

(Sheet 14)

R. 29 E.

N

Lake Sparkling

Lake Wekiwa

Bay Lake

LAKE FAIRVIEW

Fairview Shores

SEABOARD AIR LINE

Lake Sarah

Fairvilla

Lake Silver

Lawne Lake

ORLANDO DISTRICT

T. 22 S.

(Sheet 17)

(Sheet 19)

(Sheet 29)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 29 E. | R. 30 E.

19

N

(Sheet 15)

(Sheet 18)

(Sheet 20)

(Sheet 30)

T. 22 S.

Lake Bell

Pb Lf Pb Pc Lf Pb Rc Rc

Lake Killarney

Fairview Shores

Little Lake Fairview

Bishop Moore School

Edgewater School

DISTRICT 5

LAKE MAITLAND

Lake Osceola

Winter Park

Lake Sylvan

POST OFFICE

Lake Mizell

Lake Virginia

Lake Berry

COAST LINE

ATLANTIC COAST LINE

AIR LINE

SEABOARD AIR LINE

Lake Winyah

Lake Estelle

Lockhaven Park

Lake Rowena

Lake Formosa

Lake Sue

Lake Howard

Lake Spier

ORLANDO

ORLANDO AIR FORCE BASE

1 2 5 6 7 8 11 12 13 14 17 18

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

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ORANGE COUNTY, FLORIDA

(20)

N

SEMINOLE COUNTY

R. 30 E.

T. 22 S.

Crane Strand

Goldenrod

Lake Burkett

Lake Nan

Lake Martha

Perch Lake

Lake Pearl

Lake Waunatta

Lake Mira

Lake Jean

Irma Lake

SHOWALTER AIRPARK

SEABOARD AIR LINE

D I S T R I C T 5

ORLANDO AIR FORCE BASE

Lake Corrine

Union Park

Union Park Church

(Sheet 19)

(Sheet 21)

(Sheet 31)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(22)

SEMINOLE COUNTY

R. 31 E. | R. 32 E.

N

T. 22 S.

(Sheet 21)

(Sheet 23)

(Sheet 33)

DISTRICT

Lake Price

Econlockhatchee River

Lake Pocket

Lake Tanner

Corner Lake

Econlockhatchee River

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 32 E.

SEMINOLE COUNTY

23

N

T. 22 S.

(Sheet 22)

LAKE PICKETT

DISTRICT

Lake Drawdy

Lake Pickett

Lake Louise

Corner Lake

Bennett

Roberts

(Sheet 24)

(Sheet 34)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

SEMINOLE COUNTY

R. 33 E.

T. 22 S.

(24)

N

(Sheet 23)

(Sheet 25)

(Sheet 35)

DISTRICT 5

Buscombe Creek

Joshua Creek

Christmas Creek

Range, township, and section corners shown on this map are indefinite.

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0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

ORANGE COUNTY, FLORIDA

SEMINOLE COUNTY

R. 33 E. | R. 34 E.

25

N

CANAL

ST JOHNS RIVER

BREVARD COUNTY

Orange Mound

T. 22 S.

D I S T R I C T 5

ST JOHNS RIVER

Mc Pf Fs Pd Aa Ab Ac Da Db Ia Lf Ma Mb

1 2 6 7 11 12 13 14 17 18

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Range, township, and section corners shown on this map are indefinite.

(Sheet 24)

(Sheet 36)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

R. 27 E.

(Inset sheet 16) I (Sheet 16)

N

LAKE APOPKA

Winter Garden

Tildenville

Oakland

Killarney

COAST LINE ATLANTIC SEABOARD AIR LINE

D I S T R I C T 3

J O H N S L A K E

Deer Island

Black Lake

19 20 21 22 29 30 31 32 33 34 27 28

T. 22 S.

LAKE COUNTY

(Sheet 37)

(Sheet 27)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 27 E. | R. 28 E.

(Sheet 16)

27

N

T. 22 S.

(Sheet 26)

(Sheet 28)

(Sheet 38)

Winter Garden

Ocoee

Drew School

Minorville

Beulah

Lake Bennet

Lake Lily

Lake Pearl

Lake Reaves

Lake Whitney

Lake Beulah

OCOEE CEMETERY

ATLANTIC COAST LINE

SEABOARD AIR LINE

D I S T R I C T 3

23 24 19 20 26 25 30 29 35 36 31 32

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(28)

(Sheet 17)

R. 28 E.

T. 22 S.

(Sheet 27)

(Sheet 29)

(Sheet 39)

N

Lake Olympia

Lake Lotta

Lake Sherwood

Lake Herrick

Fischer Lake

Lake Rose

Lake Hugh

Lake Nally

Lake Steer

Lake Olivia

Geyer Lake

Lake Hiawassa

Lake Sansusan

Orlovista

Gotha

WOODLAWN MEMORIAL PARK CEMETERY

21 22 23 24 25 26 27 28 33 34 35 36 3

D I S T R I C T

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 29 E.

(Sheet 18)

29

N

DISTRICT 5

SEABOARD AIR LINE

Lawne Lake

Pine Hills

Spring Lake

Rock Lake

Lake Lorna Doone

Orlovista

RADIO STATION

Lake Mann

Sunset Lake

Holden Heights School

Clear Lake

ORLANDO

DISTRICT 2

DISTRICT 3

T. 22 S.

19 20 21 22

30 29 28 27

31 32 33 34

Ra Lf Pb Fs Bp Ia Bb Sc Oa Ge MI Lb Pc Rc Pa Sb

(Sheet 28)

(Sheet 30)

(Sheet 40)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 28 E.

LAKE COUNTY

3

N

T. 20 S.

(Sheet 2)

(Sheet 4)

(Sheet 7)

Neighborhood Lake

Lake Bartho

Lake Levia

Kelly Park

Rock Springs

ROCK SPRINGS RUN

ROCK SPRINGS RUN

DISTRICT 2

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 19)

R. 29 E. | R. 30 E.

30

N

Lake Formosa

SAL

Lake Ivanhoe

D I S T R I C T 5

Lake Cay Dee

Lake Shannon

23

24

19

20

Lake Adair

Lake Highland

Druid Lake

Lake Concord

Park Lake

SEABOARD AIR LINE

Lake Gear

ORLANDO AIR FORCE BASE

Lake Dot

D I S T R I C T 2

Hillcrest School

MUNICIPAL AIRPORT

Lake Yvonne

D I S T R I C T 1

ORLANDO

26

25

29

30

SEABOARD AIR LINE

POST OFFICE

Howard School

Lake Eola

COURT HOUSE

LIBRARY

COAST LINE

Lake Lawsona

Lake Underhill

CITY HALL

ATLANTIC

Cherokee School

Lake Como

Lake Cherokee

Lake Lucerne

D I S T R I C T 4

35

36

31

32

Lake Davis

Lake Weldona

Lake Arnold

Lake Giles

Lake Copeland

HOSPITAL

Lake Lancaster

D I S T R I C T 3

(Sheet 29)

(Sheet 31)

T. 22 S.

(Sheet 41)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 30 E.

(Sheet 20)

31

N

T. 22 S.

(Sheet 30)

(Sheet 32)

(Sheet 42)

Lake Susannah

Little Lake Barton

Lake Barton

Lake Claudette

Union Park

Azalea Park

ORLANDO AIR FORCE BASE

SEABOARD AIR LINE

DISTRICT 4

DISTRICT 5

21 22 23 24 25 26 27 28 33 34 35 36

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 21)

R. 31 E.

T. 22 S.

(Sheet 31)

(Sheet 33)

(Sheet 43)

Lake Downey

Lake Berge

Lake Kehoe

Little Econlockhatchee River

D I S T R I C T

19 20 21 22 30 29 28 27 31 32 33 34 5

N

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 31 E. | R. 32 E.

(Sheet 22)

33

N

T. 22 S.

(Sheet 32)

(Sheet 34)

(Sheet 44)

Econlockhatchee River

D I S T R I C T 5

23 24 19 20

26 25 30 29

35 36 31 32

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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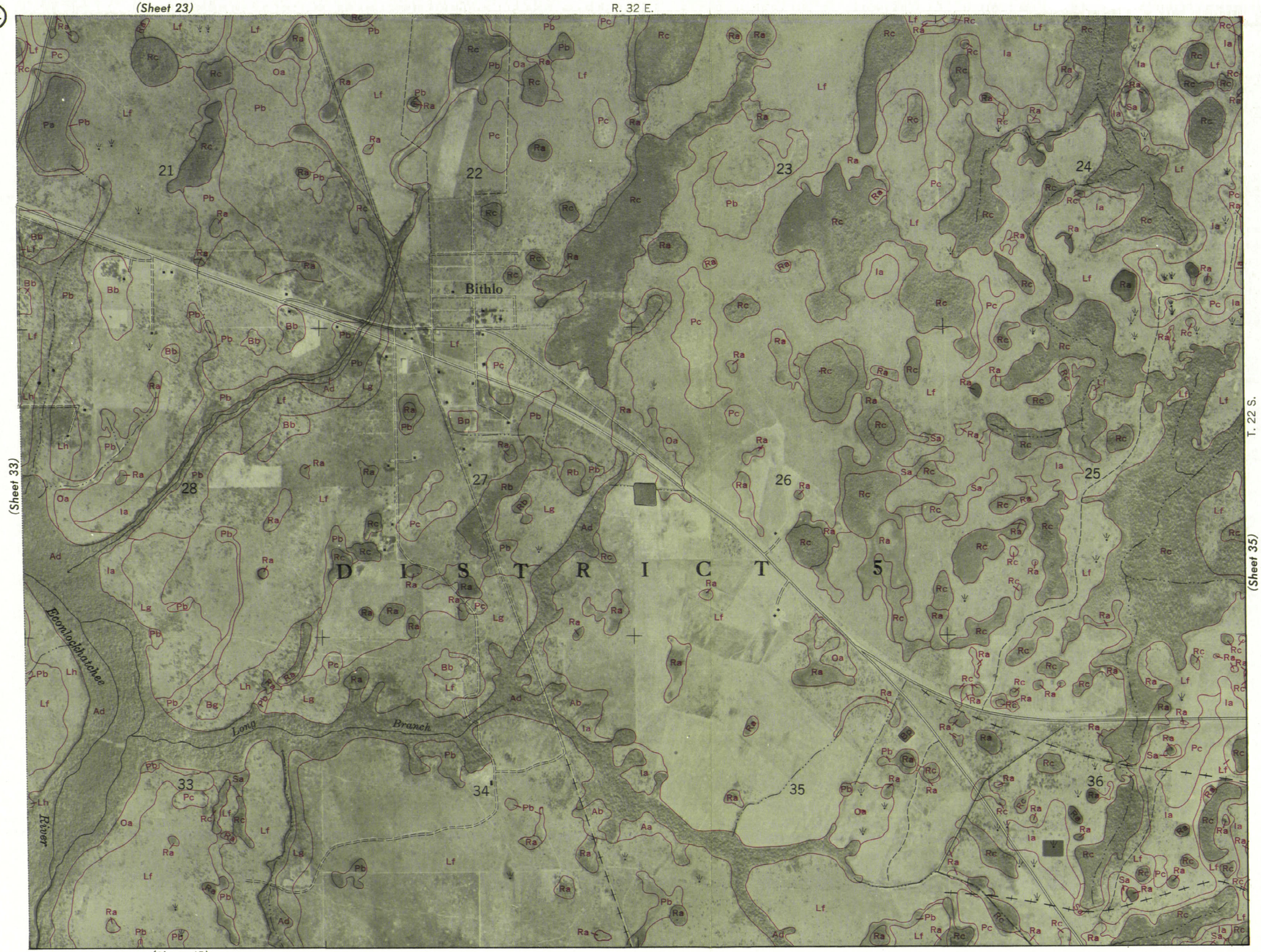
(34)

(Sheet 23)

R. 32 E.

N



(Sheet 33)

(Sheet 35)

(Sheet 45)

T. 22 S.

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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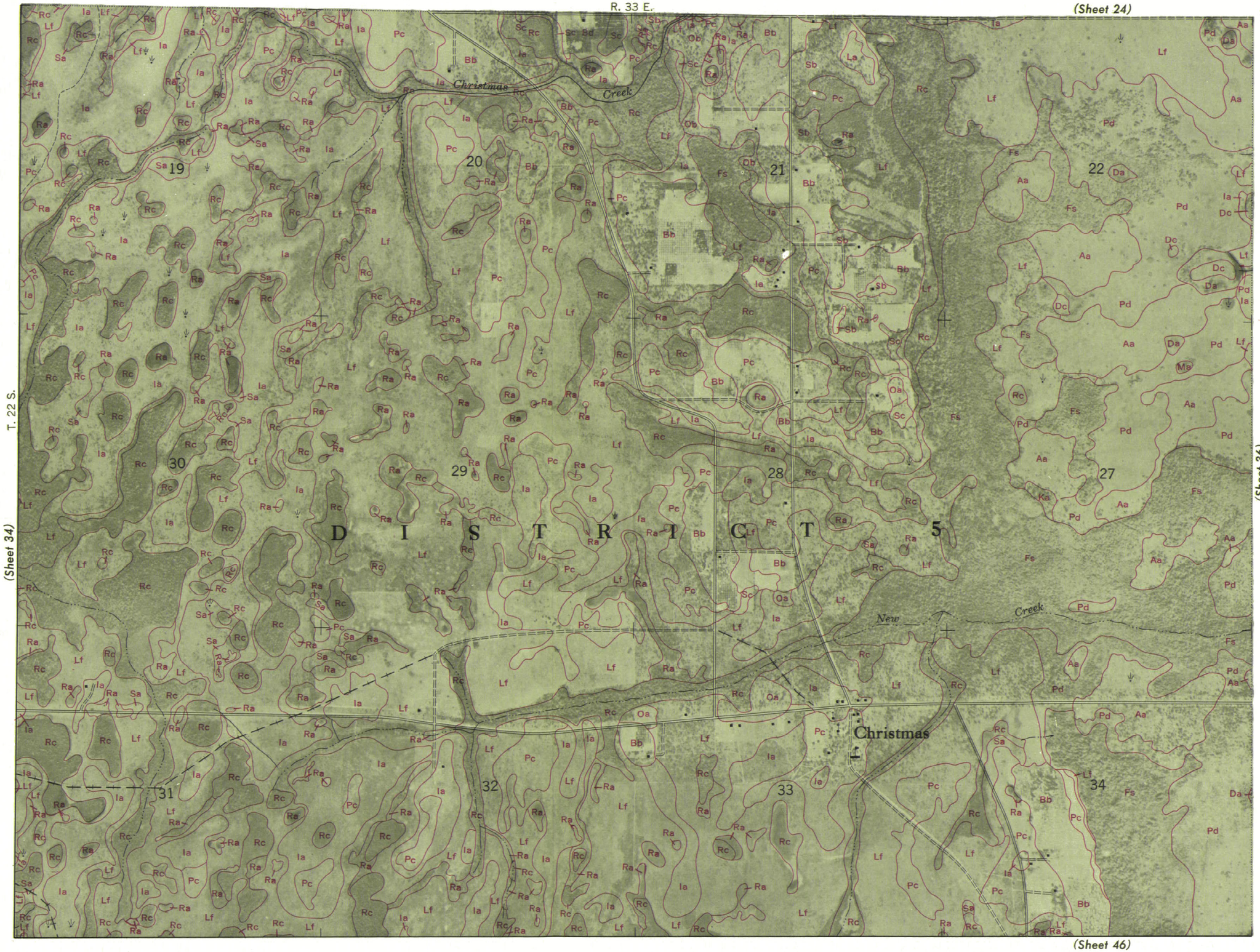

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(36)

(Sheet 25)

R. 33 E. | R. 34 E.

N

(Sheet 35)

Lake Cone

DISTRICT 5

New Creek

Creek

Tootoosahatchee

ST JOHNS RIVER

BREVARD COUNTY

T. 22 S.

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(Sheet 47) | (Sheet 48)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

(38)

(Sheet 27)

R. 27 E. | R. 28 E.

T. 23 S.

N

Lake Tilden
Lake Roberts
Lake Lintz
Lake Roper
Lake Burnak
Lake Whitney
Lake Rhea
Lake Crescent
Wauseon Bay
LAKE DOWN
ATLANTIC COAST LINE
WINTER GARDEN CEMETERY
Windermere
Summerport Beach
LAKE BUTLER
Lake Davis
Cypress Lake
Lake Bessie
Lf Lake Louise

DISTRICT

1 2 3 4 5 6 7 8 11 12 13 14 17

(Sheet 37)

(Sheet 39)

(Sheet 50)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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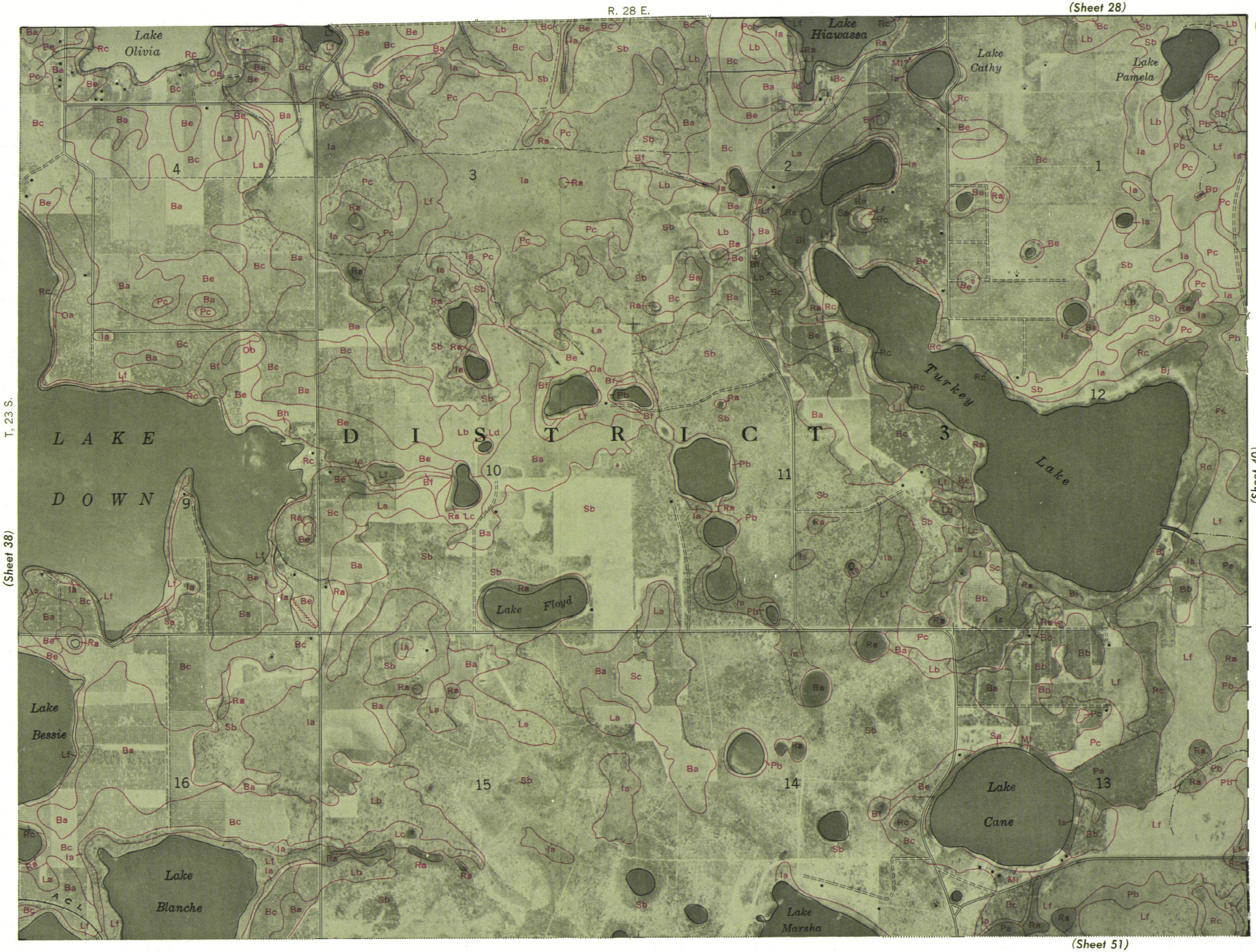
R. 28 E.

T. 23 S.



(Sheet 38)

(Sheet 40)

(Sheet 51)

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

LAKE COUNTY

R. 29 E.

(4)

N

(Sheet 3)

T. 20 S.

D I S T R I C T 2

SEMINOLE COUNTY

RIVER

WEKIWA

(Sheet 8)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 29)

R. 29 E.

40

N

(Sheet 39)

T. 23 S.

(Sheet 41)

(Sheet 52)

LIMIT OF SOIL SURVEY

Clear Lake

Lake Hodnett

Lake Holden

D I S T R I C T 3

D I S T R I C T 4

6 5 4 3

7 8 9 10

18 17 16 15

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 29 E. | R. 30 E.

(Sheet 30)

41

N

T. 23 S.

(Sheet 40)

(Sheet 42)

(Sheet 53)

DISTRICT 3

DISTRICT 4

DISTRICT 7

ATLANTIC COAST LINE

ORLANDO

CONWAY

Conway

Edgewood

Oaks Island

Lake Lurna

Lake Lancaster

Hourglass Lake

Lake Pinelock

Lake Willisara

Lake Grange

Bass Lake

Lake Tennessee

Lake Holden

Lake Jennie Jewel

Lake Gem Mary

Lake Gatlin

Lake Jessamine

Lake Margaret

Lake Anderson

Lake Echo

LITTLE LAKE CONWAY

1 2 3 4 5 6 7 8 11 12 13 14 17 18

Bc Ba Ob Oc Sc Ra Bp Oa La Lf Fs Pb Mh Pc

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(42)

(Sheet 31)

R. 30 E.

N

T. 23 S.

(Sheet 41)

(Sheet 43)

(Sheet 54)

Lake Porter

Lake Farrar

Lake Fredrica

Lake George

Conway

Little Econlockhatchee

D I S T R I C T 4

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

Range, township, and section corners shown on this map are indefinite.

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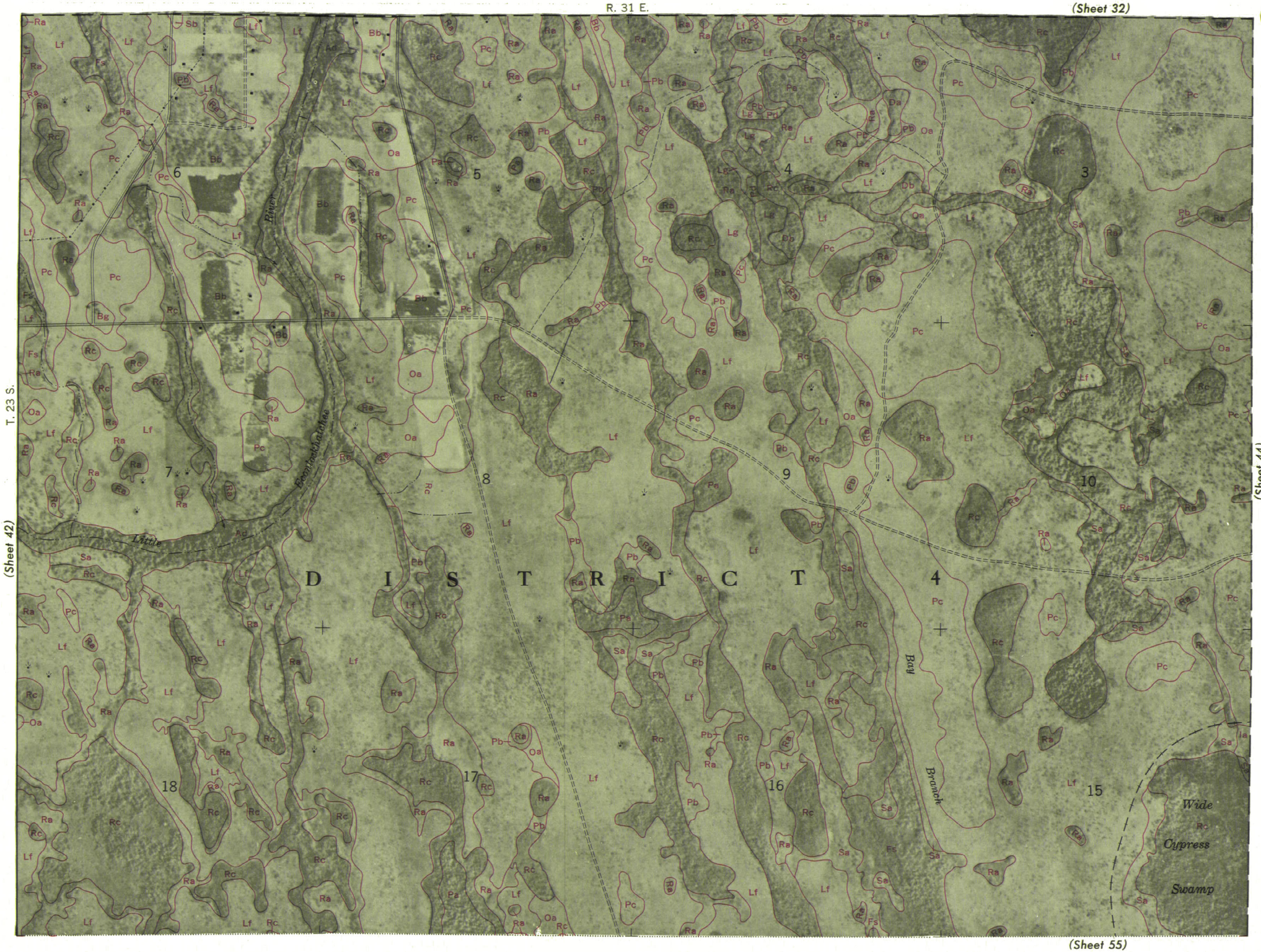

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

ORANGE COUNTY, FLORIDA

(44)

(Sheet 33)

R. 31 E. | R. 32 E.

N

T. 23 S.

(Sheet 43)

(Sheet 45)

(Sheet 56)

D I S T R I C T 5

Econlockhatchee

Hart Branch

Econlockhatchee River

Wide Cypress Swamp

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 32 E.

(Sheet 34)

45

N

T. 23 S.

(Sheet 44)

(Sheet 46)

(Sheet 57)

D I S T R I C T 5

Econlockhatchee River

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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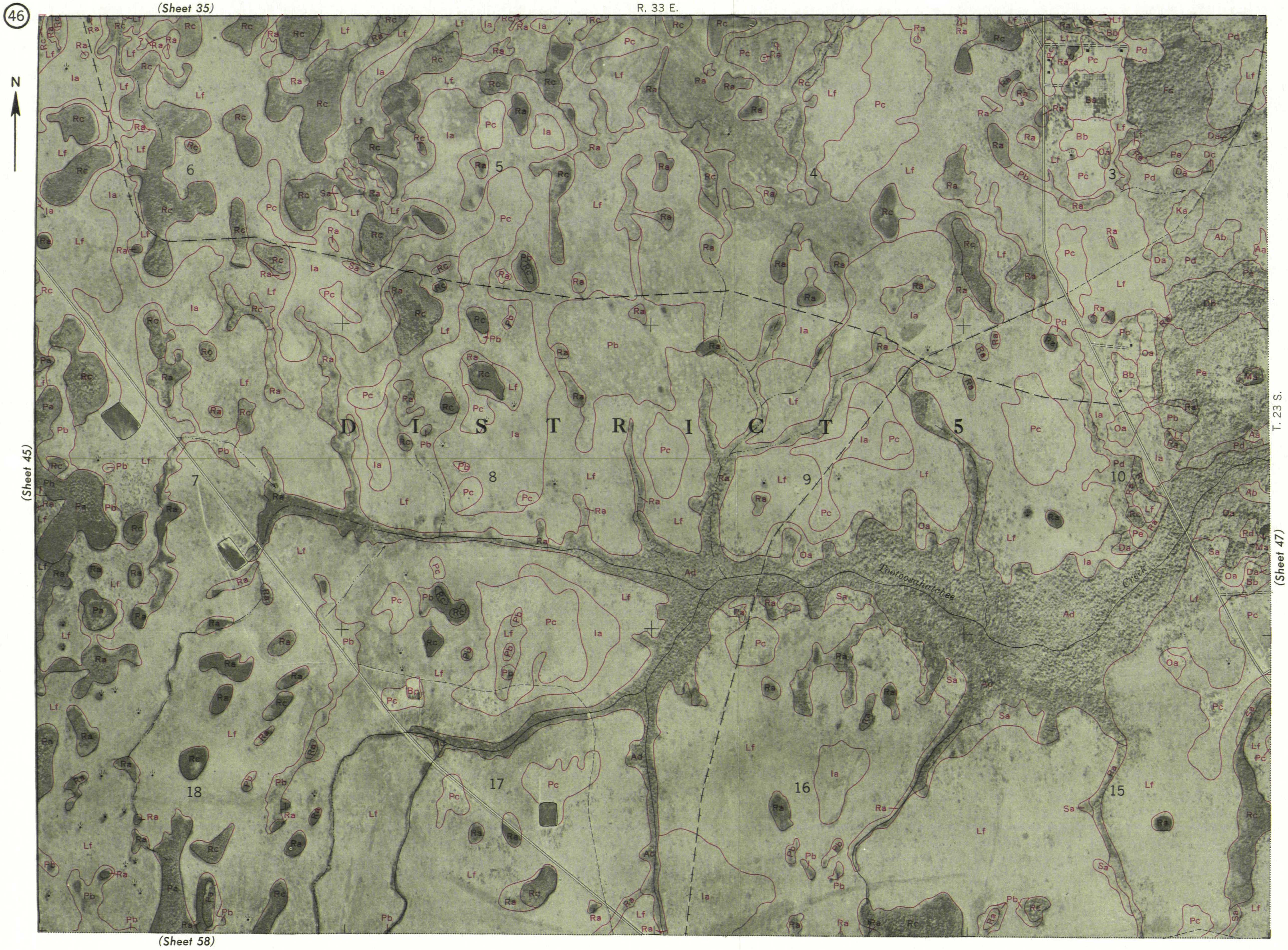
Range, township, and section corners shown on this map are indefinite.

46



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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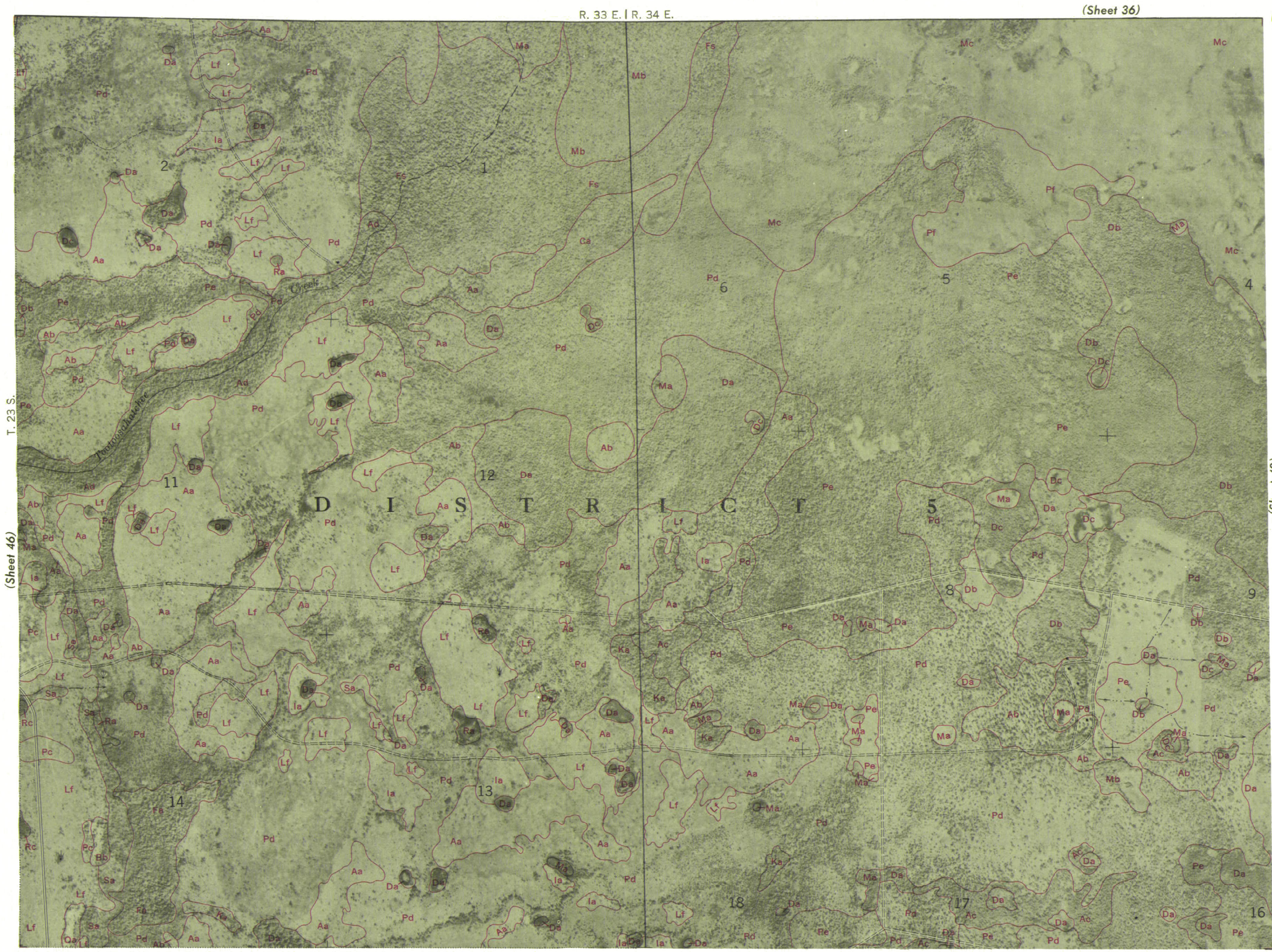

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 36)

R. 34 E.

N

ST JOHNS RIVER

BREVARD COUNTY

DISTRICT 5

Creek

James

Long Bluff

ST JOHNS RIVER

T. 23 S.

(Sheet 47)

(Sheet 60)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

Range, township, and section corners shown on this map are indefinite.

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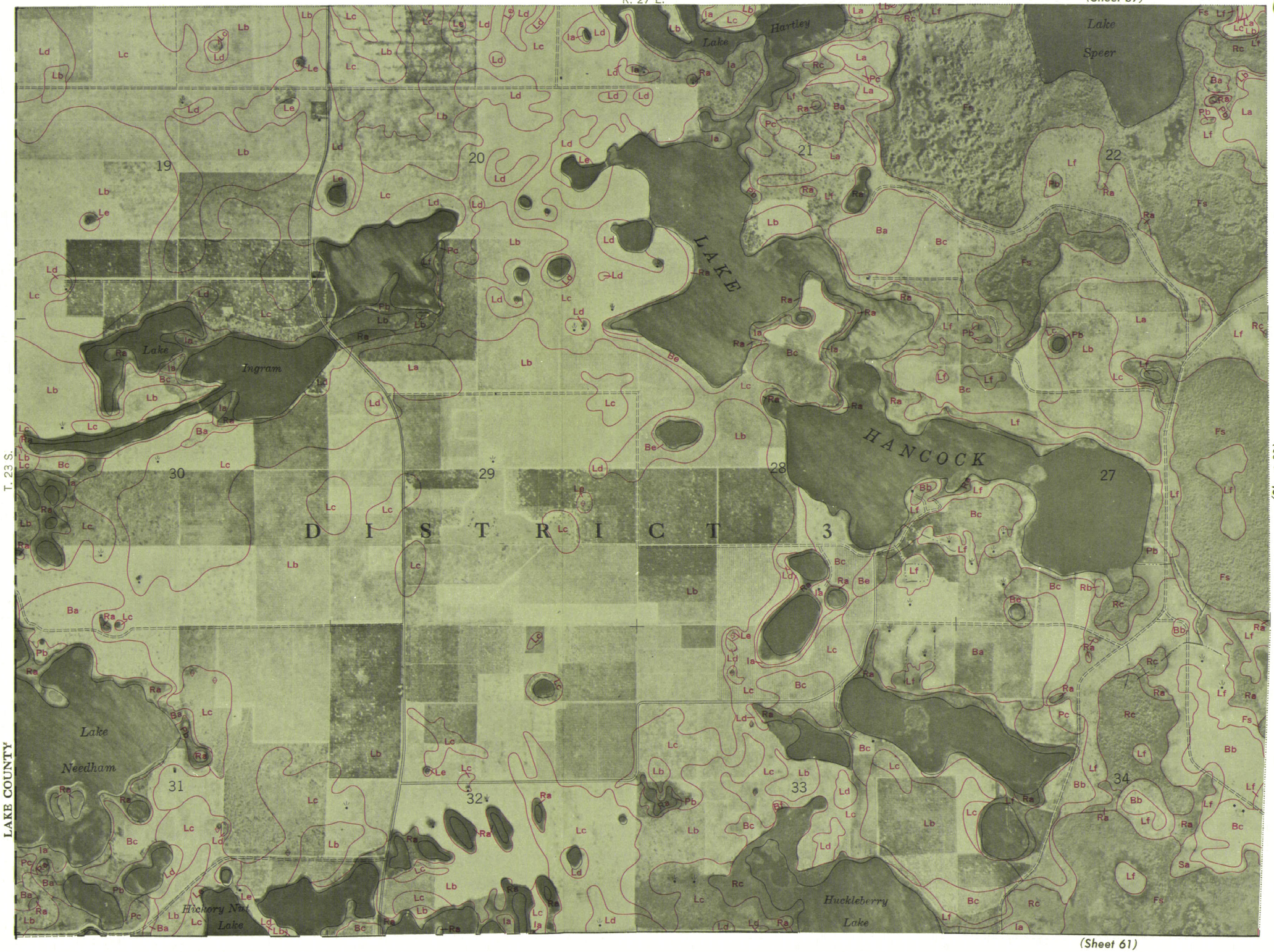

ORANGE COUNTY, FLORIDA

R. 27 E.

(Sheet 1)

5

N

T. 20 S.

LAKE COUNTY

DISTRICT 2

Zellwood

Lake Maggiore

HAMPDEN DUBOSE ACADEMY

SEABOARD AIR LINE

PUMP HOUSE

19 20 21 22 27 28 29 30 31 32 33 34

(Sheet 6)

(Sheet 9)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

R. 27 E. | R. 28 E.

(Sheet 38)

50

N

(Sheet 49)

(Sheet 62)

(Sheet 51)

T. 23 S.

LAKE BUTLER

DISTRICT 3

LAKE TIBET BUTLER

Lake Louise

Lake Isleworth

Lake Estes

Little Lake Sawyer

Lake Butt

Lake Burden

Lake Reams

Lake Sharpe

Lake Mabel

Lake Sheen

19 20 23 24 25 26 29 30 31 32 35 36

Ba Bb Bc Bd Bp Fs Ia La Lb Lc Lf MI Oa Ob Pc Ra Rc Sc

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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(Sheet 39)

N

T. 23 S.

(Sheet 50)

(Sheet 52)

(Sheet 63)

Lake Blanche

Palm Lake

Lake Marsha

Spring Lake

Little Sand Lake

Lake Sloat

Lake Tucker

Doctor Phillips

LAKE SHEEN

BIG SAND LAKE

BUTLER

TIBET

ATLANTIC COAST LINE

DISTRICT 3

21 22 23 24 25 26 27 28 33 34 35 36

Ba Bb Bc Bd Be Bf Fs La Lb Lf Oa Pa Pb Pc Ra Rc Sa Sb Sc Ia Ib Re

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

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ORANGE COUNTY, FLORIDA

(52)

(Sheet 40)

R. 29 E.

N

T. 23 S.

Rattlesnake Lake

OAK RIDGE CEMETERY

19 20 21 22

30 29 28 27

31 32 33 34

D I S T R I C T 4

(Sheet 51)

(Sheet 53)

(Sheet 64)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

Range, township, and section corners shown on this map are indefinite.

R. 29 E. | R. 30 E.

(Sheet 41)

53

N

T. 23 S.

(Sheet 52)

(Sheet 54)

(Sheet 65)

Lake Jessamine

Lake Mary

LITTLE LAKE CONWAY

Pine Castle

CONWAY

LAKE

Lake Mae

Bear Head Lake

Belle Isle

Mare Prairie Lake

ATLANTIC COAST LINE

PINECASTLE AIR FORCE BASE

DISTRICT 4

23 24 20 26 25 29 30 35 36 31 32

Bj Ba Bb Bp Fs Ia Lf Mf Oa Pa Pb Pc Ra Rc Sa Sc

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

ORANGE COUNTY, FLORIDA

(54)

(Sheet 42)

R. 30 E.

N

T. 23 S.

(Sheet 53)

(Sheet 55)

(Sheet 66)

Mare Prairie Lake

PINECASTLE AIR FORCE BASE

21 22 23 24 25 26 27 28 33 34 35 36

DISTRICT 4

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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R. 31 E.

(Sheet 43)

N

T. 23 S.

(Sheet 54)

(Sheet 56)

(Sheet 67)

D I S T R I C T 4

Bay Branch Swamp

Cypress Wade

Boggy Branch

19 20 21 22

30 29 28 27

31 32 33 34

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 44)

R. 31 E. | R. 32 E.

56

N

T. 23 S.

(Sheet 55)

(Sheet 57)

(Sheet 68)

DISTRICT 5

Cypress Branch

Wide

Turkey Creek

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

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R. 32 E.

T. 23 S.

N

(Sheet 56)

(Sheet 58)

(Sheet 69)

DISTRICT 5

Green Swamp

Econlockhatchee River

Little Econlockhatchee River

Creek

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

ORANGE COUNTY, FLORIDA

R. 33 E.

(Sheet 46)

58

N

(Sheet 57)

T. 23 S.

(Sheet 59)

(Sheet 70)

DISTRICT 5

19 20 21 22

30 29 28 27

31 32 33 34

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 33 E. | R. 34 E.

(Sheet 47)

59

N

T. 23 S.

(Sheet 58)

(Sheet 60)

(Sheet 71)

DISTRICT 5

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

(6)

N

(Sheet 2)

R. 27 E. | R. 28 E.

T. 20 S.

(Sheet 7)

(Sheet 5)

(Sheet 10)

Lake King

Lake Grassmere

Wolf Lake

Lake Cora

Lake Francis

Lake Alden

Lake Standish

McDonald

SEABOARD AIR LINE

DISTRICT 2

23 24 19 20 26 25 30 29 35 36 31 32

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 34 E.

(Sheet 48)

60

N

James Creek

DISTRICT 5

RIVER

COUNTY

BREVARD

ST JOHNS

Possum Bluff

T. 23 S.

(Sheet 59)

(Sheet 72)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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R. 27 E.

(Sheet 49)

N

T. 24 S.

LAKE COUNTY

(Sheet 62)

(Sheet 73)

HICKORY NUT LAKE

Huckleberry Lake

Lake Lartigus

Reedy Lake

Reedy Creek

Whittenhorse Creek

Beer Island

D I S T R I C T 3

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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R. 27 E. | R. 28 E.

(Sheet 50)

N

(Sheet 61)

(Sheet 63)

T. 24 S.

(Sheet 74)

LAKE MABEL

LAKE SHEEN

Lake Sharpe

BAY LAKE

South Lake

Riles Island

D I S T R I C T 3

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 28 E.

(Sheet 51)

63

N

LAKE SHEEN

BIG SAND LAKE

Pocket Lake

Lake Crowell

Fish Lake

Lake Ruby

Lake Willis

Lake Eve

Vineland

COAST LINE

ATLANTIC

Cypress Creek

T. 24 S.

DISTRICT 3

1 2 3 4 9 10 11 12 13 14 15 16

(Sheet 62)

(Sheet 64)

(Sheet 75)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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R. 29 E.

T. 24 S.

(Sheet 52)

(Sheet 63)

(Sheet 65)

(Sheet 76)

N

D I S T R I C T 4

Shingle Creek

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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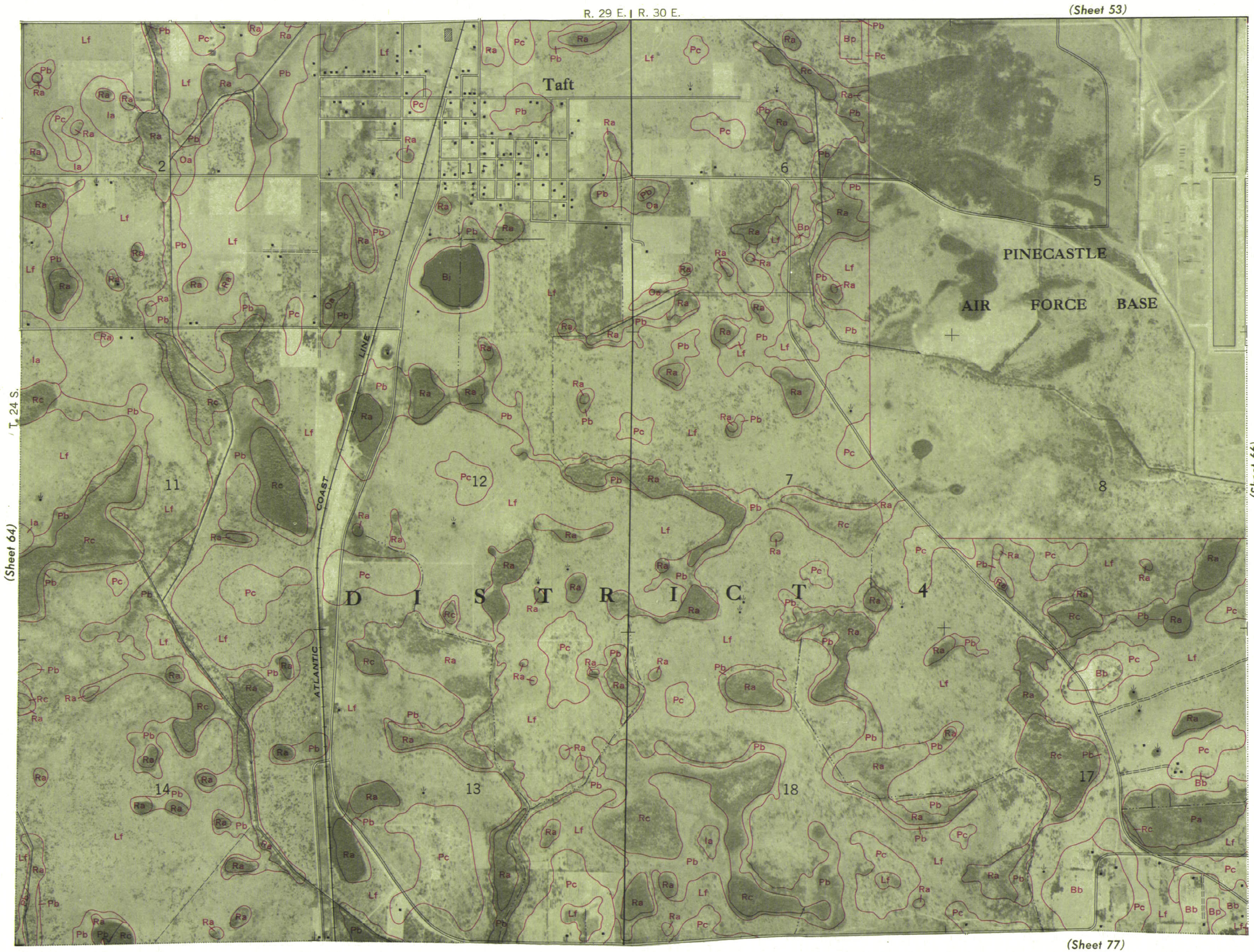

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

ORANGE COUNTY, FLORIDA

66

(Sheet 54)

R. 30 E.

N

PINECASTLE AIR FORCE BASE

D I S T R I C T 4

LAKE NONA

Red Lake

Mud Lake

Prairie Creek

Slough

Bull

Boggy

(Sheet 65)

(Sheet 67)

(Sheet 78)

T. 24 S.

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 31 E.

(Sheet 55)

67

N

T. 24 S.

(Sheet 66)

(Sheet 68)

(Sheet 79)

DISTRICT 4

Buck Lake

Red Lake

Barton Lake

LAKE HART

Hart Branch

Bolin Branch

Myrtle Bay

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

(Sheet 56)

R. 31 E. | R. 32 E.

68

N

T. 24 S.

D I S T R I C T 5

Tributary

Creek

Marsh

Island

Roberts

Island

Slough

Crosby

Crosby

Island

CANAL

DISSTON

Little

Bear

Island

Creek

Bear

(Sheet 67)

(Sheet 69)

(Sheet 80)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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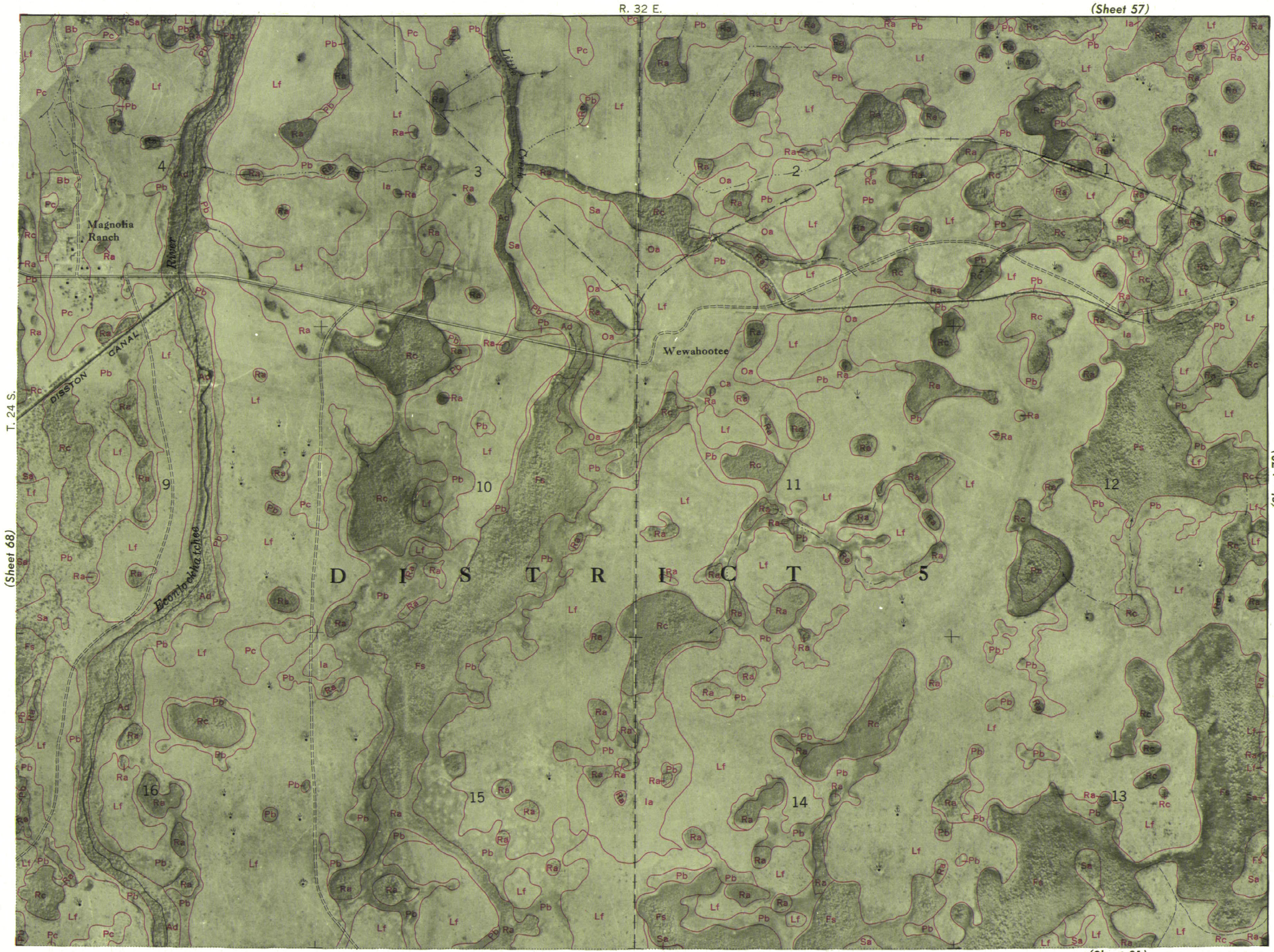

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

ORANGE COUNTY, FLORIDA

R. 28 E.

(Sheet 3)

7

N

ROCK SPRINGS RUN

T. 20 S.

21 22 23 24 25 26 27 28 33 34 35 36

D I S T R I C T 2

Prevatt Lake

Wekiwa Springs

SEMINOLE COUNTY

(Sheet 6)

(Sheet 8)

(Sheet 11)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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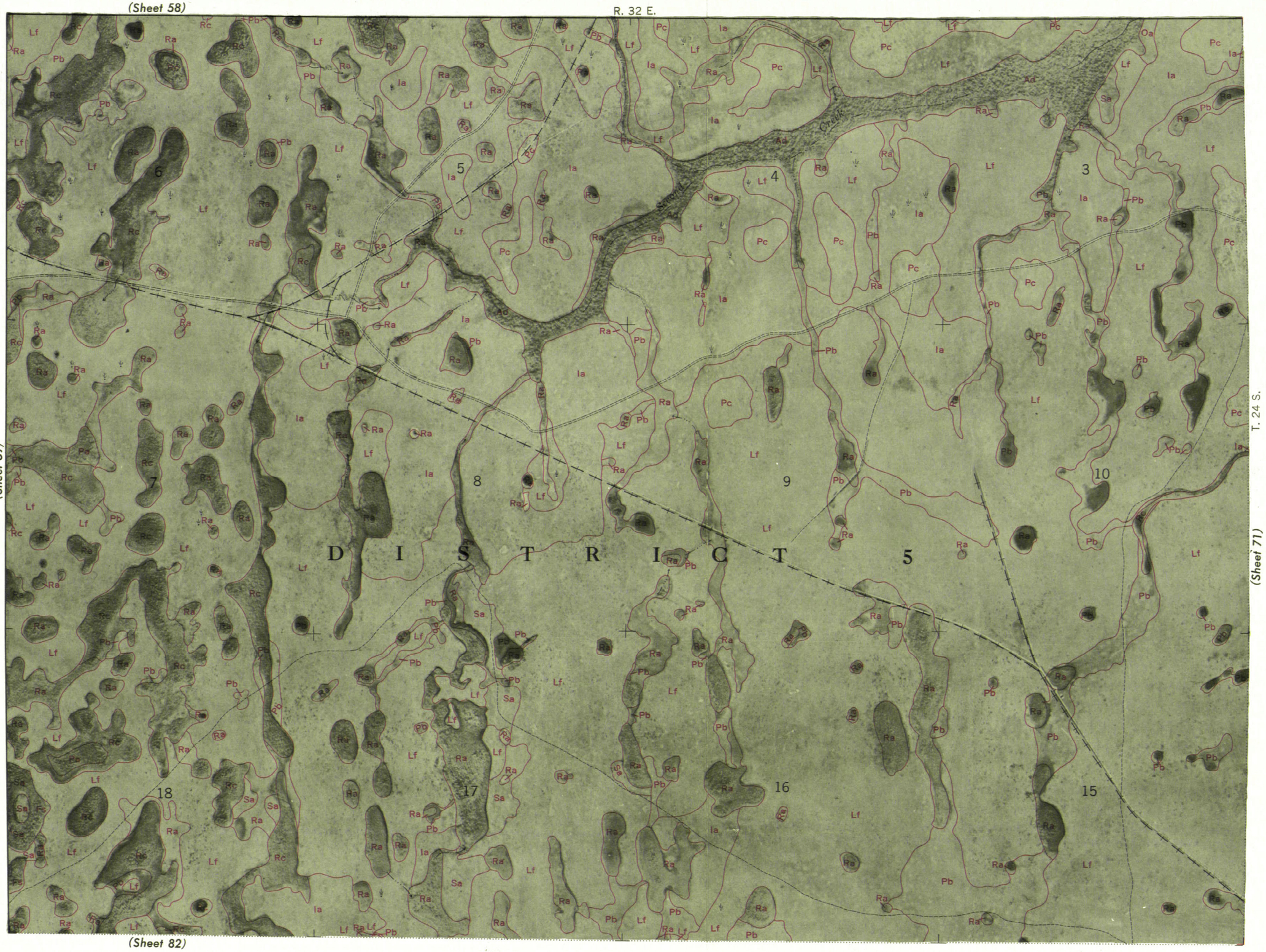
Range, township, and section corners shown on this map are indefinite.

(70)

(Sheet 58)

R. 32 E.

N



T. 24 S.

(Sheet 69)

(Sheet 71)

(Sheet 82)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 33 E. | R. 34 E.

(Sheet 59)

71

N

T. 24 S.

(Sheet 70)

(Sheet 72)

(Sheet 83)

DISTRICT 5

James Creek

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

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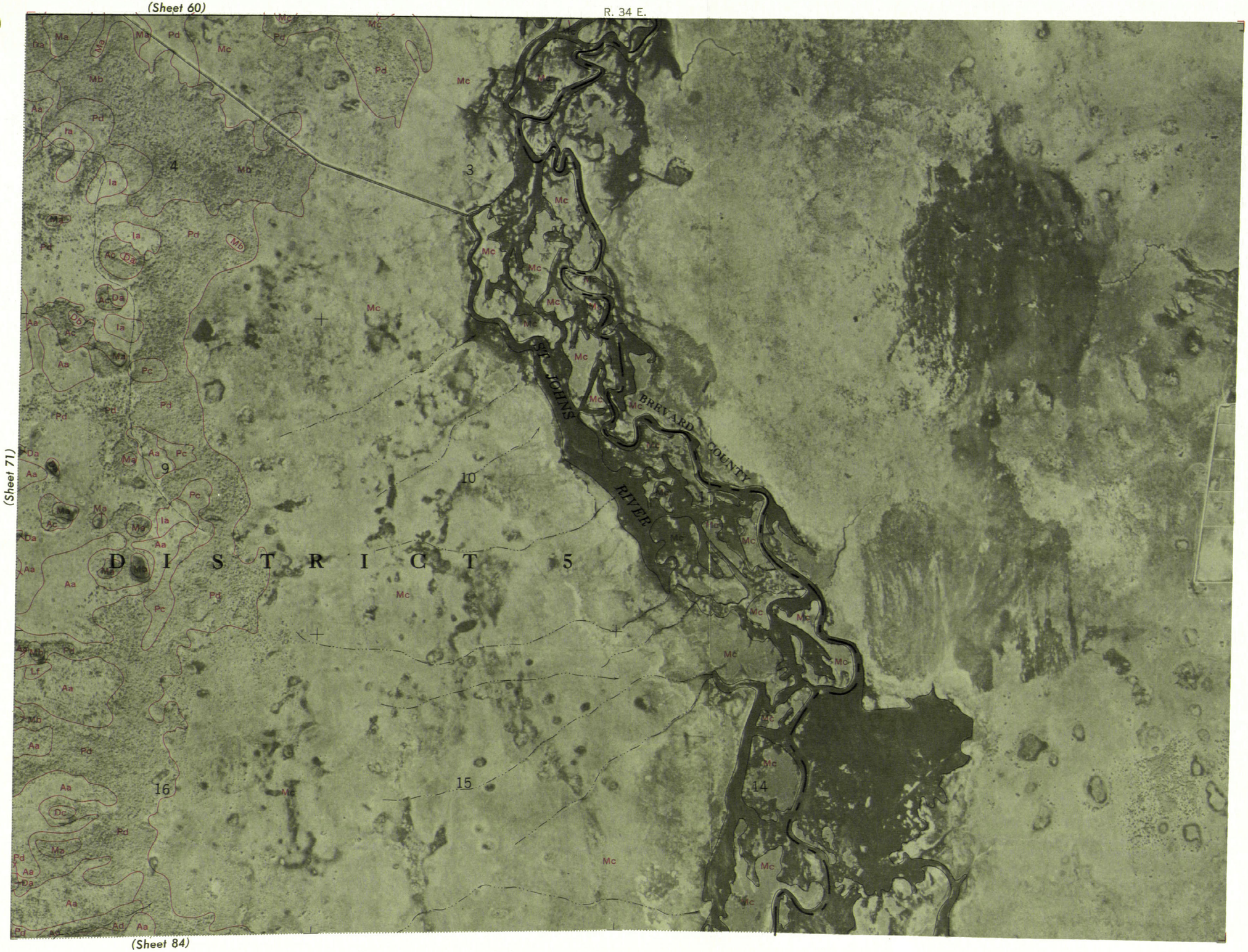

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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(Sheet 61)

R. 27 E.

N

T. 24 S.

DISTRICT 3

Whitehorse Creek

Bear Island Creek

Boggy Creek

Lake Gifford

Lake Raccoon

Britt Lake

Boggy Creek

19 20 21 22

30 29 28 27

31 32 33 34

LAKE COUNTY

OSCEOLA COUNTY

(Sheet 74)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

(74)

(Sheet 62)

R. 27 E. | R. 28 E.

N

T. 24 S.

(Sheet 73)

(Sheet 75)

Reedy Creek

Cypress Creek

Fremont Creek

D I S T R I C T 3

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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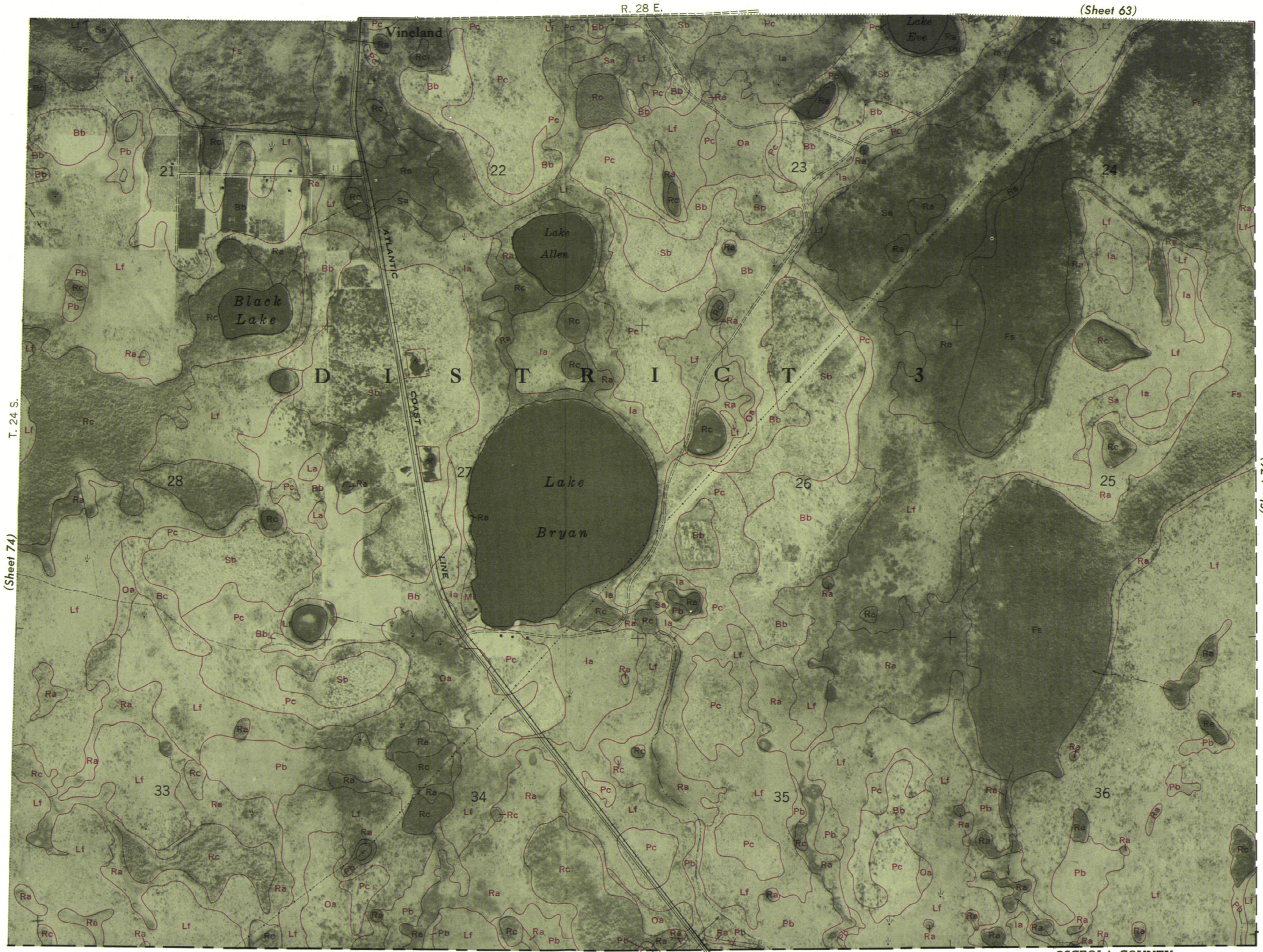
ORANGE COUNTY, FLORIDA



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Range, township, and section corners shown on this map are indefinite.

ORANGE COUNTY, FLORIDA

(Sheet 64)

R. 29 E.

76

N

(Sheet 75)

T. 24 S.

(Sheet 77)

19 20 21 22

30 29 28 27

31 32 33 34

D I S T R I C T 4

Shingle Creek

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

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ORANGE COUNTY, FLORIDA

R. 29 E. | R. 30 E.

(Sheet 65)

77

N

(Sheet 76)

(Sheet 78)

T. 24 S.

Flamingo

Swamp

Creek

Boggy

Boggy

COAST LINE

ATLANTIC

DISTRICT 4

23 24 19 20

26 25 30 29

35 36 31 32

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 30 E.

(Sheet 66)

78

N

(Sheet 77)

(Sheet 79)

T. 24 S.

Mud Lake

Boggy Creek Swamp

Ossie Branch

Lock Haven Church

D I S T R I C T 4

21 22 23 24

28 27 26 25

33 34 35 36

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 31 E.

(Sheet 67)

79

N

T. 24 S.

(Sheet 78)

(Sheet 80)

Barton Lake

LAKE HART

DISTRICT 4

19 20 21 22 29 28 27 30 31 32 33 34

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

(Sheet 4)

R. 29 E.

T. 20 S.

(Sheet 7)

N

DISTRICT 2

19

20

29

30

ROCK SPRINGS RUN

WEKIWA RIVER

SEMINOLE COUNTY

Mc

Pd

Fs

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 68)

R. 31 E. | R. 32 E.

80

N

(Sheet 79)

(Sheet 81)

T. 24 S.

Lake Hart

Moss Park

L A K E M A R Y J A N E

Econlockhatchee River

Econlockhatchee Swamp

Roberts Island

North Roberts Island

D I S T R I C T 5

23 24 19 20 26 25 30 29 35 36 31 32

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 32 E.

(Sheet 69)

81

N

T. 24 S.

D I S T R I C T 5

Boggy Creek

Fourmile Creek

Econlockhatchee River

Swamp

Hell Bays

21 22 23 24

28 27 26 25

33 34 35 36

(Sheet 80)

(Sheet 82)

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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(Sheet 70)

ORANGE COUNTY, FLORIDA

R. 33 E.

82

N

(Sheet 81)

T. 24 S.

(Sheet 83)

19 20 21 22

30 29 28 27

31 32 33 34

D I S T R I C T 5

Hell Bays

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

(Sheet 71)

R. 33 E.

R. 34 E.

T. 24 S.

(Sheet 82)

(Sheet 84)

83

N

DISTRICT 5

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

OSCEOLA COUNTY

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Range, township, and section corners shown on this map are indefinite.

(84)

N

(Sheet 72)

R. 34 E.

ORANGE COUNTY, FLORIDA

(Sheet 83)

T. 24 S.

21 22 23 27 28 33 34 35 36

ST JOHNS RIVER

BREVARD COUNTY

Mulberry Mound

Taylor Creek

Lake Poinsett

DISTRICT 5

OSCEOLA COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

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ORANGE COUNTY, FLORIDA

R. 27 E.

(Sheet 5)

9

N

T. 21 S.

D I S T R I C T

L A K E A P O P K A

LAKE COUNTY

(Sheet 10)

PUMP HOUSE

Scale 1:20 000

0 ½ 1 Mile

0 5 000 Feet

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